GAS

FEBRUARY 1960

Peak shaving

A CHILTON PUBLICATION

THE NATION'S NATURAL GAS AUTHORITY

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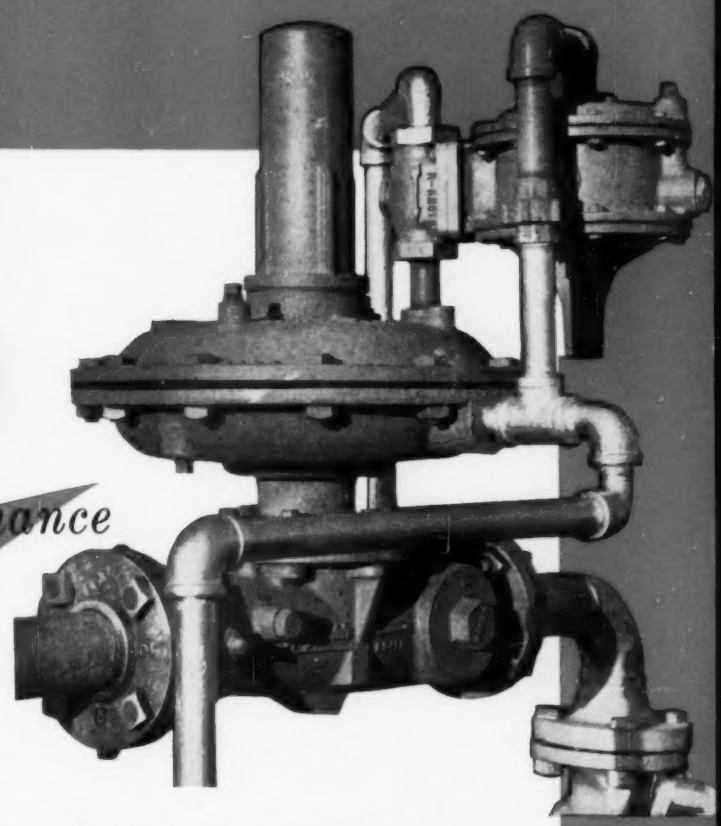
for Peak Performance



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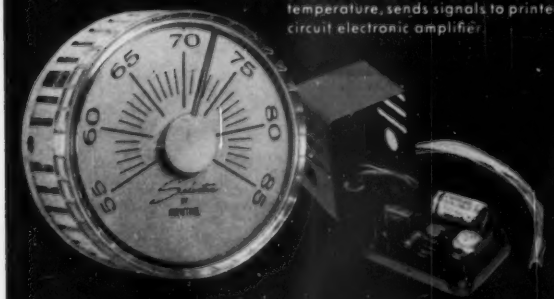
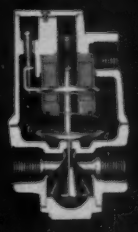
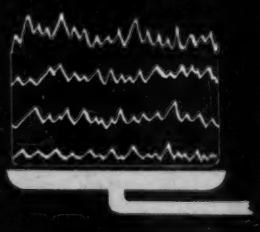


Selectra valve does double duty as a regulator and as a modulator in response to power output of amplifier.



Selectra infinitely modulates flame from full input to ⅓ input. It's not just a "full fire—low fire" system.



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BPA

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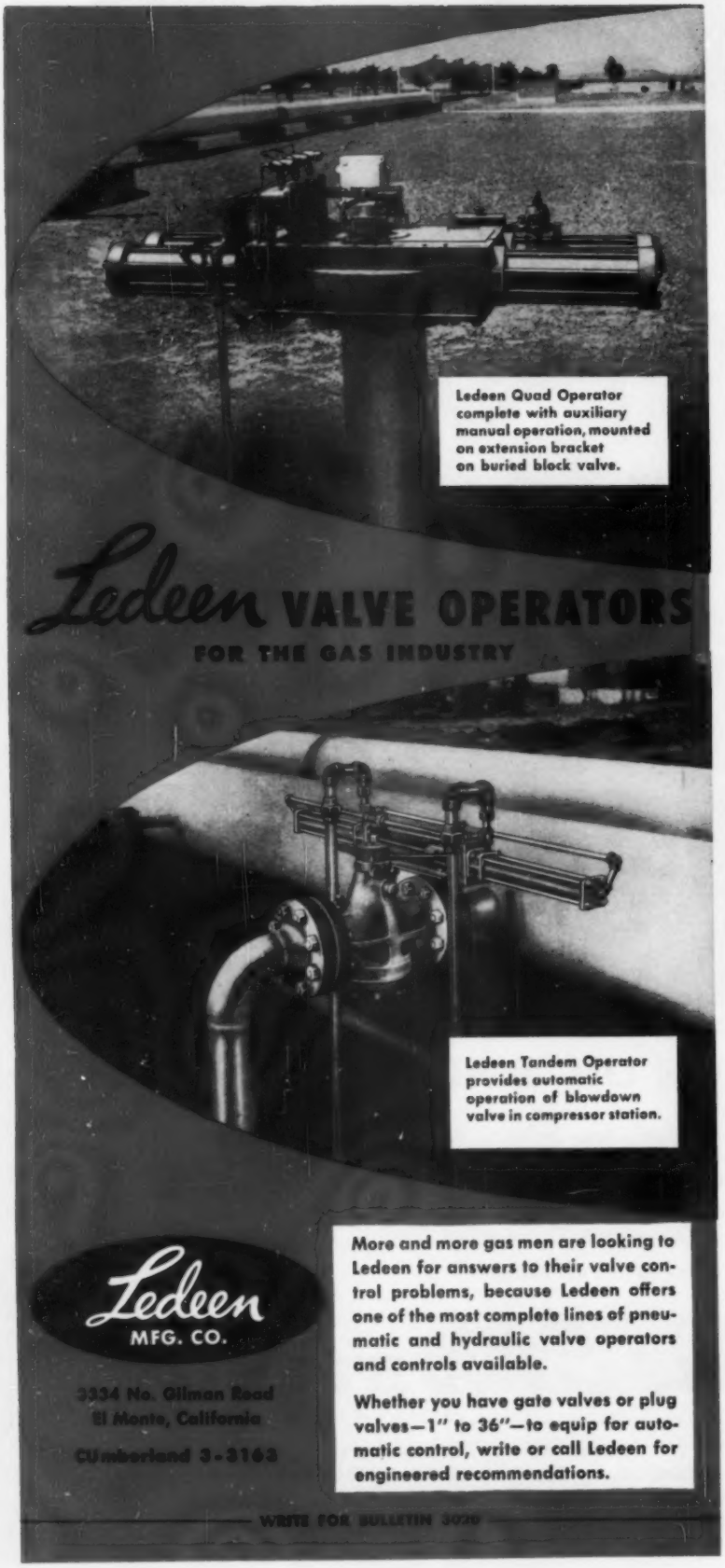
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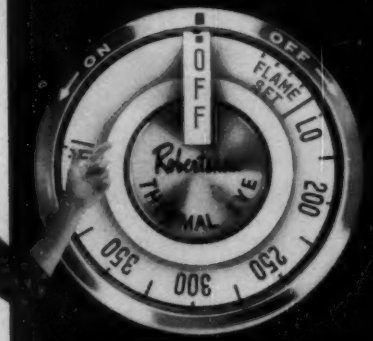

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GAS

FEBRUARY, 1960

Thermally Thinking

ANY company buying or selling gas needs a strong gas measurement department. Why, then, have several measurement men told me in recent months that they feel the status of gas measurement personnel in gas companies is slipping fast?

Perhaps the apathy of gas measurement personnel has contributed more to this collapse than we realize. And some who are very conversant on the matter credit the currently popular gas company organizational trend of operating by geographical area rather than by function, with precipitation of the decline.

Some background is worthy of exploration. Until the late forties, natural gas was the poor step-child of oil and products. I am told that since it had little value, it was most often half measured. No one cared. It follows that gas measurement was often delegated to people not well qualified as engineers or technicians.

Now, natural gas does have value. It cannot be ignored. But we do find too many of the lacking types from the cheap-gas days still working in the science of gas measurement and even in command.

The condition of gas measurement in oil companies is, as a whole, a pathetic and laughable matter. People who know much more about this than I have said that if it weren't for the basic integrity of gas pipeline companies, the average producer would suffer. It has even been submitted to me that if gas transmission companies wanted to—and let me make it clear that none do—they could steal many producers into bankruptcy without working at it very hard. Is some of the oil company policy rubbing off on the gas companies?

Perhaps it is. Organizational structures of gas companies are subject to change—which may be the understatement of the year. These changes usually result from a long-range study, made either internally or by a consulting firm that specializes in such matters.

The net result involving gas measurement is often that management is told that an engineering department can design and select measurement stations and equipment better than existing active measurement personnel. Then, they may conclude that the general accounting department can best handle chart calculations, etc., and that pipeliners or distribution operating people are the better metermen.

Well, I don't know about that. One has to admit that the management consulting firms have a lot of brains and experience on their side. It is difficult, if not foolhardy, for an ill-equipped one like myself to challenge their concept. But to me, anyway, gas measurement is too specific a science, too specialized an art, too precise a function to be entrusted to those other than highly trained, specialized gas measurement people. Good measurement men are not born. They are made from education, experience, and dedication.

I am also wondering if gas company managements and consultants are entirely correct in controlling all operating responsibilities through the head of a geographical area.

If you have men who are equally proficient in a variety of operations, perhaps the one-man control system will work out well. But, where do you find men who are expert in gas compression, gas measurement, pipeline construction and maintenance, communications, cathodic protection, etc. Like as not you don't. You have men who are pretty "heavy" in one or two of the operating functions and "light" on the others. Too often these district heads are "light" on measurement.

I think the measurement function in any gas company is too important, too basic to the industry and its relations with the public to be included among a group of other operations. Measurement especially suffers under geographical area operations control because it needs to be treated in its entirety (company wide), rather than piecemeal, to properly coordinate this extremely precise and critical activity.

Gas measurement as a career will become a hopeless field unless management can be convinced of the importance of measurement and a strong, unified measurement organization. Measurement men should wake up to this, become more progressive and aggressive.

J. Fred Edson
EDITOR

GAS INDUSTRY NEWS
SUPERIOR NOW A DIVISION OF NEPTUNE METER COMPANY
Superior Meter Company becomes Division of Neptune Organization

NEWS
FOR GAS UTILITIES

A message to our friends in the Gas Industry

from William H. Cochrane, President, Neptune Meter Company

I'm happy to announce that Superior Meter Company has been merged into Neptune Meter Company's corporate structure. Our former subsidiary will now be known as the Superior Meter Division of Neptune, and will have Walter H. Sieger, Vice President of Neptune and for 26 years a Neptune executive, as General Manager.

Neptune operates in many measurement fields. We have a wealth of experience in accurately measuring and controlling the volume, weight and temperature of gases, liquids and solids. We produce measurement instruments and systems for utilities, municipalities, agriculture; for industry and for defense.

Superior Meter Division operates with its own sales organization as a self-contained unit within our team. It will benefit in many ways by being a member of the team . . . through the use of our warehousing facilities and through the interchange of experience and knowledge gained from our research and development programs. Like the other divisions of Neptune, Superior will now have the technical and financial resources to exploit major advances in measurement. As a result, we are sure that you in the gas industry business will also benefit.

At Neptune we are proud of our position as a leader in the measurement field and as the world's largest manufacturer of liquid meters. And we are proud to have Superior as an integral part of the Neptune organization. For "superior" hardcase and tincase meters and meter parts, look for the name:

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GAS HIGHLIGHTS

Strike end eases steel tension

As the steel strike ended last month, there was no immediate easing in steel supplies, but there was relief of tension that was reflected in the premium price market. What about prices? The IRON AGE, an affiliate of GAS, says steel prices will increase (and soon, perhaps, but without fail in any case) not more than $5 nor less than $4 per ton. On cold-blooded analysis, says the authoritative magazine, the union, through government help, scored a major victory. The steel companies, under government pressure, lost their battle along major fronts.

Canadian Energy Board meets

During the first week in January, the National Energy Board, a product of Canada's Royal Commission on Energy, cranked up its first session. It is predicted that as you read this, the board will have acted on some six applications to export Canadian gas to the U. S. If not, then the ruling is just around the corner.

The body will base its decision on FPC-like explorations into markets, natural gas reserves, deliverability, etc. However, they haven't had the time to develop all of the rules and long-drawn out procedures that we find in FPC; at least, U. S. gasmen hope not. They do have some intervenors up there—20 at least.

The gas industry, business and Washington scoreboard as we see it now

Gas legislation—none from Congress this year.
Rate of return—FPC will allow between 6.5 and 7.0 per cent, most likely nearer 6.5 per cent.
Depletion—there will be forceful attacks, but the present 27.5 per cent tax depletion allowable won't be disturbed.
Taxes—no major corporation or personal tax relief in 1960.
Antitrust—tougher laws, particularly those dealing with mergers.
Gas prices—a workable formula for field pricing will be forthcoming from FPC—this year.
Canadian gas—Canada's NEB will authorize exports to three or four times the current volume.
Costs—Congress, by several actions, will raise the cost of doing business for all firms.
Labor—a new labor-management control drive will be seen in the Congress—but we don't look for any major legislation resulting this year.

Air conditioning in southern California

Yes, friends, Pacific Lighting System operating companies have handed Arkla Air Conditioning Corp. the largest (we and they think) purchase commitment ever experienced for gas-fired air conditioning. Involved: 2000 to 2500 Arkla 3- and 5-ton units.

Whirlpool Corp. shows lightweight new refrigerator

Whirlpool Corp. unveiled its new line of refrigerators a year early at the NAHB show in Chicago, Jan. 17. The 3 models, all 13 cu. ft., have cut weight by 50% with an air-blown system that permits reduction in condenser, absorber, and evaporator sizes plus a re-designed generator and thin-wall tubing. Most service can be done from the front of the new refrigerators.

Hot patter from AGA

A new 22-min, 16mm, color-sound movie on the hazards and control of static electricity, on and off the job, is available. And a new book is out this month: "Gas Rate Fundamentals." Personals: The new A.G.A. MONTHLY editor is Bernard Kaapcke; Chet Stackpole had still another birthday on Jan. 21—that evening, he and Wister Ligon (AGA's prexy) attended National Business Publication's annual "Silver Quill Award" dinner in Washington, D. C., along with Cabinet members, those in diplomacy, the military, industrial giants, and lessor nobles.

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W-250	Rated capacity 250 cfh	—	FOB Philadelphia
W-300	Rated capacity 300 cfh	—	FOB Philadelphia
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Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

A western giant grows

IN the last 15 years El Paso Natural Gas Co. has grown from a $40 million pipeline company to a giant of $1 billion. El Paso had 200 miles of mainline before it attached the California market, and now has 6700 miles of pipeline in Texas, New Mexico and Arizona to the California border. A Federal Power Commission examiner issued a certificate of public convenience and necessity to El Paso recently authorizing the acquisition of all of the facilities of Pacific Northwest Pipeline Corp. FPC later affirmed the examiner's decision. The El Paso giant now has a system capacity of 3 billion cu ft daily and is delivering 2 billion cu ft of that total to distributing companies in California, but it will grow with the addition of the Pacific Northwest system, plus the insatiable California market. Pacific Northwest Pipeline has about 2000 miles of pipeline with a system capacity of 646 MMcfd.

• El Paso's acquisition of Pacific Northwest Pipeline's stock

In 1957 El Paso acquired Pacific's stock. El Paso's president Paul Kayser testified that the primary purpose for the acquisition was to gain access to the vast and relatively untouched Canadian gas reserves for El Paso's markets. The next purpose in importance was gaining access to the reserves of the Rocky Mountain area.

In July 1957 the Attorney General brought a civil action in the Federal District Court in Utah alleging that the stock merger violated the Clayton Act because it would substantially lessen competition or tend to create a monopoly. The Government's complaint requested the court to order El Paso to divest itself of the common stock of Pacific. In 1958 the court continued the trial until the final determination of FPC on El Paso's application to acquire the facilities of Pacific.

The FPC examiner considered the objectives of the Clayton Act. He also noted that the Clayton Act is not applicable "to transactions duly consummated pursuant to authority given by" the FPC. He said that "this shows a positive legislative intent to permit mergers of natural gas companies when found by the commission to be in the public interest."

The examiner made the following analysis and conclusions:

• Competition

Pacific Northwest Pipeline was never a real competitor for a share of the California market. Mr. Bennett, representing the Attorney General of California, had said "California has no wish to be made solely dependent for a commodity so vital as this upon a single supplier." Since then FPC authorized Transwestern as another gas supplier and Pacific Gas & Electric is processing an application for a pipeline to import Canadian gas to California. "Thus, it is quite possible that instead of one, California will now have three suppliers of out-of-state gas, even after Pacific becomes extinct." The elimination of PNW as a possible competitor for the California market appears to do no violence to the public interest.

Competition for gas supply in the producing areas must be weighed. Pacific Northwest will be eliminated as a competitor for gas reserves in San Juan basin, Aneth, the Rocky Mountain fields, and Canada. El Paso will have competition in those gas producing areas from Transwestern, Colorado Interstate, Mountain Fuel Supply, Pacific Gas Transmission, and others. El Paso already has competition in the Permian basin and Panhandle-Hugoton areas, where PNW was not competing. "The elimination of Pacific as a competitor for the purchase of gas in producing fields is not of great consequence when there remain other strong competitors for gas in all producing fields to which the unified company will have access. Such elimination of Pacific will do no real harm . . ."

• Improved gas supply and utilization of gas reserves

It is in the public interest that California, which is now importing 2 billion cu ft of gas daily and has proposals for 1 billion more, and all other states served by El Paso and Pacific Northwest Pipeline have adequate future supplies. It is in the public interest that California have access to the additional gas reserves in Canada and the Rocky Mountain area, and those reserves are greater than Pacific Northwest Pipeline's requirements. "There will be an integrated pipeline system from west Texas to Canada which will be well supplied from its various sources of gas; and such system gas may be taken to any system market from the point closest thereto. A quite economical operation of the system will inevitably result." The integrated company will be in a position to receive and sell Canadian gas to its various markets, by displacement or directly, while having large United States sources of supply available.

Canadian gas and Rocky Mountain gas received into Pacific's system are largely dry gas. El Paso needs to have more dry gas to en-

able it to take greater quantities of residue gas, which depends on oil production in the Permian basin and similar sources. Dry gas helps utilize pipeline capacity better, and will give El Paso longer life for gas reserves to reduce its bond money cost.

• A financially stronger gas supplier

Pacific Northwest Pipeline has experienced operating losses. Capital expenditures could not be made for expansion of markets. "This merger of the two companies into a financially strong natural gas company cannot fail to bring very much earlier to the Pacific Northwest that type of natural gas service to which it is entitled as a part of the gas consuming American public."

As the surviving corporation El Paso is entitled to use for income tax purposes a tax loss carryover of $23,734,923, which represents net operating losses incurred by Pacific Northwest Pipeline. Such tax loss carryover would not be available to El Paso as a parent company.

"It would appear that El Paso itself will be in a stronger financial position after the merger than before; and the merged company should be stronger than either El Paso or Pacific as independent corporations. The evidence shows that the merged company should be able to attract debt equity capital readily and upon quite favorable terms. This inures to the benefit of the consuming public."

El Paso will acquire new sources of gas which it can offer to California for its growing needs.

Pacific Northwest Pipeline's customers will get better gas service for the growth in population, industry and commerce.

El Paso's policy will be to give natural gas service to every community within economic reach of the unified system.

"The attachment of the Pacific system to El Paso's markets will eventually bring about an elimination of the idle capacity now existing in the Pacific system, to the benefit of the system consumers by the reduction of unit transportation costs through this system."

Flexibility of operation will result from central control of the entire unified pipeline system, and that is an advantage in rendering proper service.

No new rate increase will be filed in Pacific Northwest Pipeline service area for at least one year from approval of the merger by FPC.

The elimination of duplicate service functions will exceed $1 million a year. Savings may result in future financing of the merged company. This is in the public interest. "There is a likelihood that the economies to be effected by the merger will result in a reduction in the cost of service, which will be of benefit to the consuming public served by the unified system."

The authorized merger is to have no effect upon any rate being paid by any customer of either El Paso or Pacific Northwest Pipeline.

El Paso, a western giant, is growing and no one can foretell when it will reach the limit of its growth. ■

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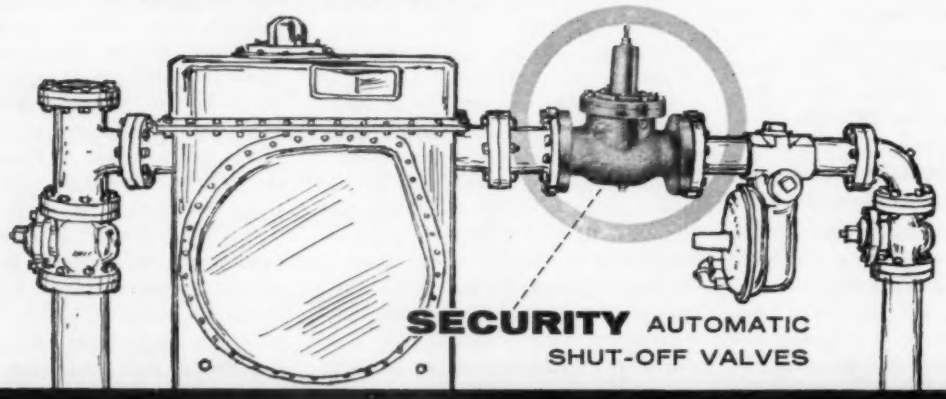

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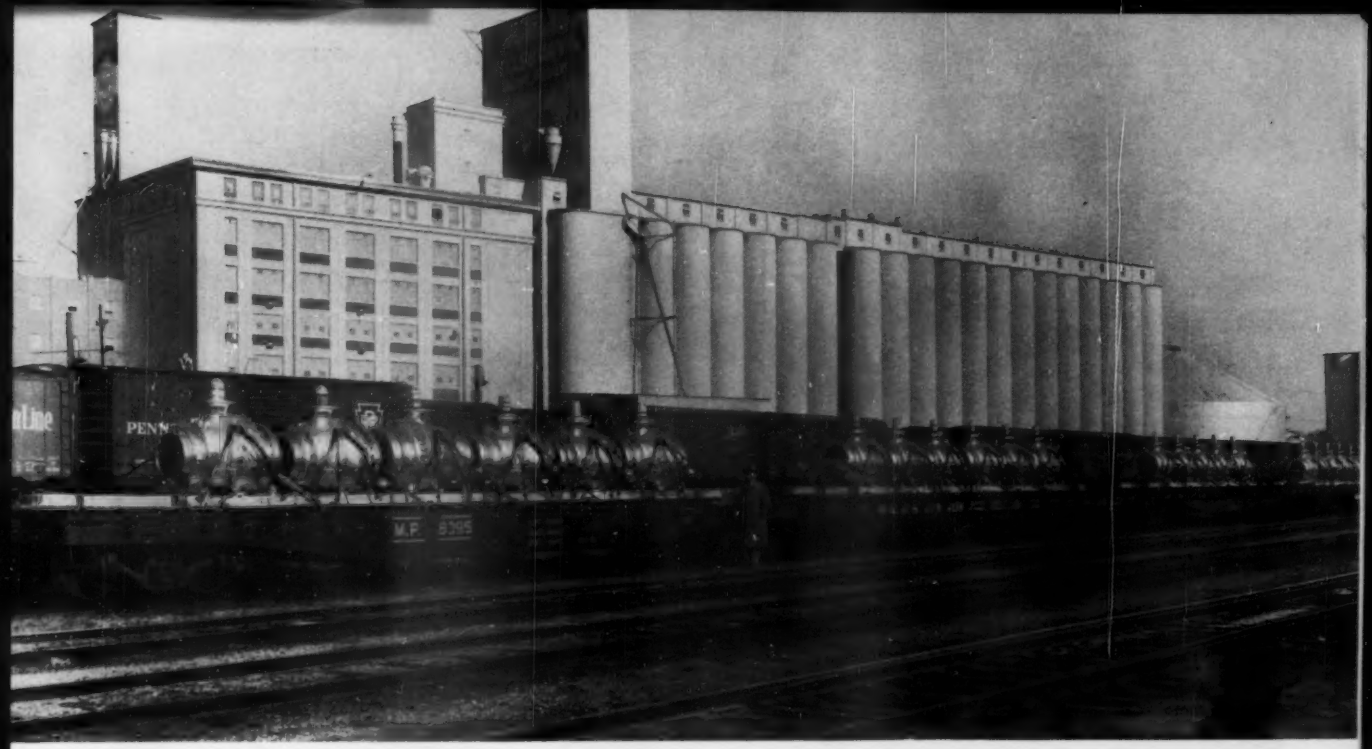


Flat carloads of Rockwell Hypresphere valves ready for shipment to a western gas transmission company.

ACCEPTANCE: BY THE TRAINLOAD

The trainload of Rockwell Hypresphere lubricated spherical plug valves (above) is dramatic evidence of the immediate acceptance of this valve by oil and gas pipeline engineers. Introduced just a little over a year ago (after three years of rugged field testing) the Hypresphere has been specified on most of the big, new pipeline jobs. Why?

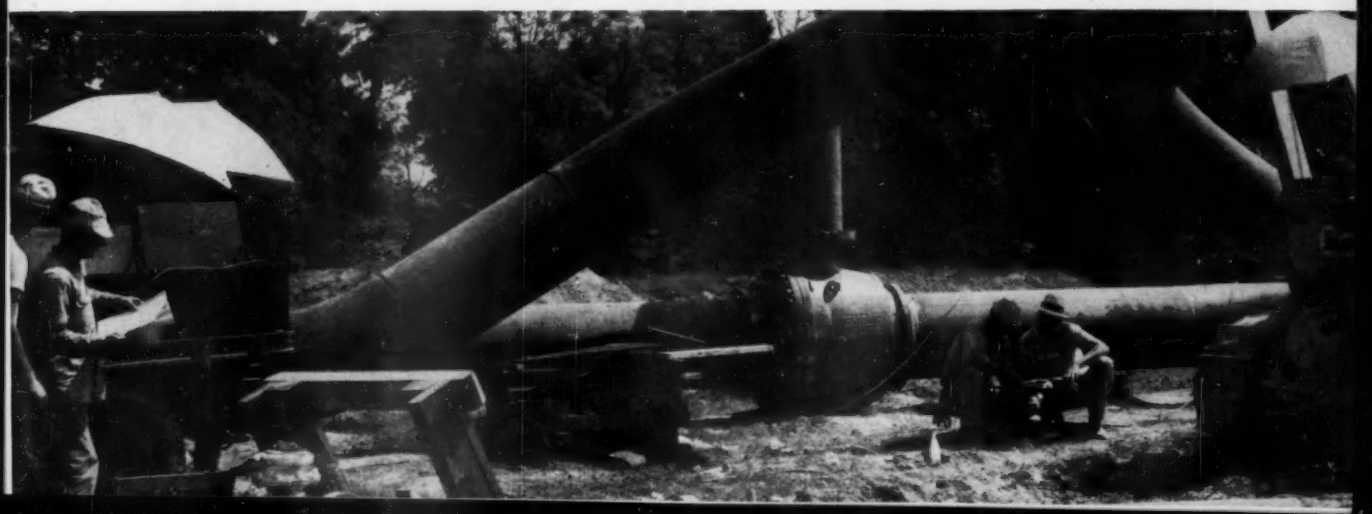
The Hypresphere gives pipeline engineers all of the advantages of a lubricated plug valve (positive shut-off, easy operation, faster closure and lubricant economy) with a full round port opening. Also, the Hypresphere is far more compact than non-lubricated valves of equivalent size and pressure rating. Why not get full details plus information on the *complete* line of Rockwell-Nordstrom standard and Hypreseal lubricated plug valves. *Write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited; Rockwell International, S.A., Geneva, Switzerland.*

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

Rockwell Hypresphere ready for underground installation. Note compact size for 30-inch valve.

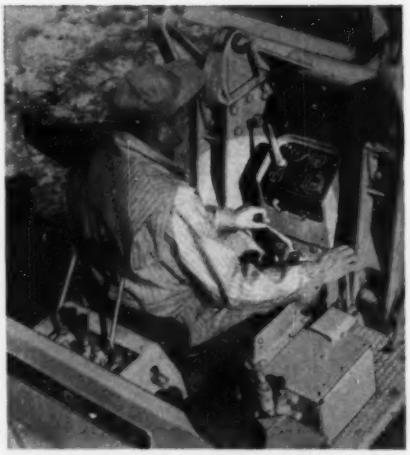


New John Deere 440 Crawler does more work "Single-Handed"!

The John Deere Crawler with Pilot Touch gives you an extra hand to *work* with, because *one* hand on *one* lever does all the driving—steer, stop, go, and reverse. The operator can give full attention to loader, winch, blade, or scarifier—producing more, and doing a better job in the bargain. Less effort is required—practically all clutch and brake footwork is eliminated.

Pilot-Touch control is an optional feature provided on both Diesel and gasoline "440" Crawlers. Any unit in the full line of John Deere Industrial Equipment is available on terms of the John Deere Credit Plan. See your dealer or write for the detailed information you need.

John Deere Industrial Division • Dept. 2506, Moline, Illinois



Drive crawler with left hand—control loader bucket with right—cut cycle time!

JOHN DEERE *"Specialists in Low-Cost Power with a Heavyweight Punch"*

TECHNICAL TRENDS

By GUY CORFIELD

Advances in fuel cell research and development

Reports of continued and promising research and development on the fuel cell are appearing regularly in the technical and semi-technical press. Estimates of practical applications are as optimistic as three or four years hence. While such reports and predictions are sometimes unduly optimistic or even erroneous, their continuance and persistence indicate a solid background of accomplishment.

An interesting paper entitled "Significance of Fuel Cell Research to the Gas Industry," by R. B. Rosenberg of the Institute of Gas Technology in Chicago, was presented at the 1959 AGA Operating Section conference. The author rather cautiously concluded that "indications are that it may be attractive in the future for the gas industry to become the prime energy supplier for several types of fuel cell applications. Whether or not this will be very attractive, economically, is not clear at this time. However, recent developments in the fuel cell field appear to justify the conclusions that this prospect is technically feasible." This paper indicates participation in the fuel cell research field by many big names of the industrial world.

The U. S. Army, through a release from the Office of Technical Services of the U. S. Department of Commerce states that "Fuel cells, which produce electrical power direct through a chemical reaction, may one day power automobiles or substitute for auxiliary diesel engines, but considerable research remains to be done. For this reason, a recently appointed Army Fuel Cell Steering Committee has gathered data on advancements in the field and published its first report on the current status of fuel cell development." This 110-page report, PB151804, "Status Report on Fuel Cells," June 1959, may be ordered from O.T.S., U. S. Dept. of Commerce, Washington 25, D. C. Its cost is $1.25.

One of the most recent and startling reports (last October) was that Allis-Chalmers Mfg. Co. had built and operated a 20-hp tractor, powered by fuel cells fueled with propane. Very little detail has been revealed beyond the statement that 1008 cells were employed, and the reaction within the cells was aided by a catalyst coated on the electrodes. The published photograph looked quite impressive.

Research talent everyone can use

With present accent on research, often said to be necessary for industrial survival—much less success—the problem arises as to what research is needed, and how and where to get it done. Having decided that research is indicated, the first question is whether to do it internally or have it done outside.

To assist in this decision, a recently published article entitled "Research Talent Everyone Can Use," in the March 1959 issue of *Nation's Business*, is very informative. It lists and gives details of 6 types of organizations "engaged in research for others," as follows: Universities, research institutes and foundations, government laboratories, industry-sponsored laboratories, for-profit organizations, and consultants.

Incidentally, among industry sponsored laboratories, the American Gas Association is at the top of the list. The article goes on to state: "In general, these (industry-sponsored) organizations are concerned with industry-wide problems, and their services are generally available only to member companies. A company, however, whose normal field of endeavor would disqualify it from membership, will usually find a cordial reception to inquiries seeking information which is already available."

The article gives additional detail. It advises how to decide on the research facility in terms of the nature and extent of the problem, its probable duration, its competitive and proprietary aspects, its need for special talent, etc. It also gives some "don'ts" which, if disregarded during relations with the research agency, may result in disappointments. For instance, don't hold back information, expect pre-ordained results, etc.

This article can be obtained as a reprint at 15 cents per copy, or $10.15 per hundred, from *Nation's Business*, 1615 H Street N. W., Washington 6, D. C. Remittance should accompany order.

Palynology assists the search for oil

Many devices and techniques are used by petroleum geologists in their search for oil. One procedure, that has developed fairly recently and has now become part of the bag of tricks of most major oil companies' exploration departments, is palynology. It is the study and correlation of spores, pollens and other minute plant and animal microfossils that occur in oil, sediments, outcroppings, underground drillings, salt deposits, etc. These minute survivors of early plant, animal and marine life are widely distributed and practically indestructible. They have definite characteristics that can be observed under a compound microscope.

By studying their similarities and differences, much can be learned of the underground geology. It can be determined whether widely separated oil wells tap the same or different reservoirs. Rocks can be dated relatively, the formation and movement of strata can be explored, and the location of ancient sea shores (favorable to the formation and accumulation of oil) can be disclosed.

Ten 20-ft. lengths of rigid pipe after being coupled. Two workmen did this job in only 20 minutes!

Workmen joining two sections of 1¼" rigid pipe.

ARIZONA PUBLIC SERVICE COMPANY SAVES 50% WITH

RIGID PIPE

made of* ABS *Plastic

RIGID PIPE GAS SYSTEM INSTALLATION OFFERS NEW PROOF OF SUPERIORITY OVER CONVENTIONAL TYPE

Big news for happy housewives in Gila Bend, Arizona—the convenience of gas utility service for the first time! Important news for utility companies everywhere—the 50% savings over cost of conventional pipe gained by use of Anesite rigid ABS pipe made of CYCOLAC throughout the system! Saved precious man-hours, too! Arizona Public Service Company completed the job in record time . . . insured a failure-free system with this lightweight, leak-proof, AGA-approved pipe. Another example of better service . . . bigger savings from rigid plastic pipe in vital municipal installations!

BE *ABSolutely* SURE . . .
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WEST VIRGINIA

By NEIL REGEIMBAL
GAS Washington Bureau

National fuels policy this year?

CHAMPIONS of bigger and better federal regulation of natural gas and oil are going to move on the offensive this year.

Principal aim will be to convince Congress to adopt an innocent-sounding national fuels policy with its attendant bureaus and powers.

They may come pretty close to getting just that.

In the past, the group that might be described as anti-gas industry was composed of competing coal interests and their suppliers and a few eager politicians who claimed their only interest was protecting the consumer. Now, they've been joined by a bloc of on-the-fence lawmakers who figure that in this election year they can join in the fight for the fuels policy and easily win a few votes.

Formerly, this group became active only in fighting against situations—against natural gas legislation; against the present gas and oil tax depletion allowances, against any efforts to untangle the web of federal controls or to encourage growth of the industry.

But now the group is initiating its own programs. Politically, they have some favorable conditions. It's going to be easy to generalize support for "conserving our natural resources" by preventing waste and insuring that each fuel is most efficiently used.

And it's going to be easy to attack anyone who opposes such high-sounding principles as selfish, unprincipled, or unpatriotic.

Conversely, it'll be tough to sell the actual effects of what the supporters of the fuels policy want—greater federal control of fuels competing with coal, and the resulting cost increases and unbalancing of normal economic competition.

Various factors have created the vacuum in the fuels arena in Congress this year, which the anti-gas groups are moving into. In the past, they've been too busy worrying about a gas bill or jabbing at the depletion allowance to push a positive program of their own.

But with gas legislation admittedly set aside for this year, and any serious congressional study of the gas and oil depletion rate at least another year away, the fuels policy supporters appear to have a clear track.

Whether they'll come home a winner is another story. They could, but it's doubtful. More likely is a successful first step in winning creation of a joint Senate-House committee in Congress to study the need for a national fuels policy.

This would not be a small success. While it sounds preliminary, the purpose of such a committee would not only be to study the need for a policy, but to publicize the drive through public hearings and reports. Eventually, it would draft specific legislation with the help of the coal industry.

Danger of the proposal is twofold. For one thing, it's primarily a move to create more federal controls over the gas industry. And if it goes like the sponsors want, it will mean controls which will limit ("conserve" proponents say) gas uses to space heating and similar "high" uses.

Advocates of the move frankly say that the reason a national fuels policy is needed is the present "cut throat dumping of natural gas into traditional coal industrial markets (which) presents a threat to the national economy and the general public."

This is the pitch they are using now to drum up support. They are pointing to FPC and court approvals under present laws of natural gas for boiler fuel use in Chicago and New York. They contend that such "dump" sales produce revenue losses which must be made up, "and it's the householder who pays through the nose." They refer to industrial off-peak sales as "the fast-buck philosophy of that (the gas) industry."

In plugging for the national fuels policy, the coal and other interests also dwell on a conservation theme. "The nation's supply of natural gas isn't going to last forever—and it will last a lot less than forever if it is foolishly squandered in uneconomic uses where coal could do a better job," one coal official says. He insists that when the American people realize what is happening, they "will not stand for the reckless squandering of the nation's birthright of natural gas simply to allow a few pipeline companies to make a fast dollar and operate at their most profitable capacity."

The national fuels policy drive is the first tangible result of the formation a year ago of the National Coal Policy Conference, and the reorganization and rejuvenation of the older coal industry groups. They've made no bones about their plans to go after the markets they have lost to natural gas and oil in the past few decades. They'll use public relations, advertising, lobbying, and any other tool they can find. Top-notch public relations and advertising firms are on the payroll and working hard.

Continued on page 93

U-COTE

...will never be the villain!

U-Cote® black fittings—manufactured *exclusively* by Union Malleable—will never be the villain in the drama of "Rust and Corrosion," or, "Who Made the Mess".

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Shipping Depots in Principal Cities Assures Overnight Service

Cathodic protection an art

As Arizona Public Service Co.'s (Phoenix) Frank Buck sees it, practical cathodic protection is an art. In a paper before PCGA, he defined "art" as the systematic application of knowledge or skill in effecting a desired result.

To kick off his presentation, Mr. Buck asked his listeners these four questions:

(1) How many times have you had to prepare a job to go back to install insulators in a pipeline that had been in the ground only a short time?

(2) How many times have you uncovered a service to install a magnesium anode when, at the same time, across the street, a company service installation crew drives up to install a service to a new house?

(3) How many times have you taken readings on a rectifier station and had a company serviceman drive by, honk his horn, and wave to you?

(4) How many times have you tried to locate contacts across the insulators on a gas meter and crossed the path of a company meter reader?

His questions served to point out problems in the engineering, installation, operating and maintenance phases of cathodic protection. The author detailed the "art" as involved with each of these phases. And although the paper is "old," having been delivered in 1958, his pointed summarization might be of interest to many corrosion engineers:

(1) An adequate cathodic protection program should be routine, systematic, and as important as any other gas system program.

(2) To reduce costs, the work should be done by existing personnel or other crews already in the area.

(3) The program should be kept simple.

(4) New methods and materials must be continuously considered if improvements are to be made.

(5) It is a company affair.

(6) It is apparent that the program (cathodic protection) is not self running as it calls for one central directing and coordinating body. This body should consist of the corrosion engineer and his staff.

Corrosion problems in Florida

Natural gas came to peninsular Florida in 1959. With the increased underground activity that resulted, came interesting information about corrosion prevention for gas systems.

One who reported was Joseph Frink, with the Houston Corp. in St. Petersburg. In a paper delivered to a regional NACE meeting, he cited the problem of living with systems having a combination of coated and wrapped steel piping, and bare cast iron and galvanized piping.

Likewise, soil conditions or, at least, the variety of them, in Florida may give some corrosion prevention people pause. There are near ideal soils in the center of the state that display resistances from 100,000 to 250,000 ohms/cm and up. However, this happy condition seems to fade rapidly on approaching coastal areas.

Resistances as low as 50 ohms/cm are not unknown in the coastal regions and some salt water is actually encountered, in spots, at gas main level. Such conditions can be found in the Miami area and along bays, bayous, and rivers. Lumping the whole soil evaluation into one ball of wax, Mr. Frink reports that he has soil conditions that make it almost impossible to corrode a piece of steel pipe, while on the other hand there are areas where the same piece of pipe would be gone in six months.

Since Florida's population has exploded in recent years, there has been almost frantic underground activity by utilities, with the exception of gas companies. Vast new underground facilities were producing appreciable stray currents volume in existing cast iron and galvanized gas piping systems at the time natural gas was introduced. To cure this situation, all old and new gas meter installations are required to be insulated at the meter inlet. Naturally, this will take time and is expensive. But Frink reported that such a program was critically needed to provide partial protection to the older systems, as well as the new.

The Houston Corp. is placing all new gas mains under cathodic protection. This piping is also being coated and wrapped except for relatively small sections of the system located in central Florida in the fairly ideal soils. However, spot coating and wrapping is specified on the bare lines as there are occasional areas where soil resistivities drop below 10,000 ohms/cm.

Sacrificial anodes (magnesium, both packed and bare) are used where tests indicate the requirement.

Plan 5th Appalachian corrosion course

The general committee of the Fifth Annual Appalachian Underground Corrosion Short Course chose June 1-3 as the dates for the 1960 session.

The course is conducted annually at West Virginia University in Morgantown, W. Va. It is endorsed by the National Association of Corrosion Engineers and the American Water Works Association.

This year's course will cover eight main groups of underground corrosion. Fifty-seven classes, 15 new papers, and 25 new speakers are scheduled. Along with classroom instruction, there will be field demonstrations of coating materials and instruments, exhibits and movies. A round-table discussion on underground corrosion is being planned for one evening session.

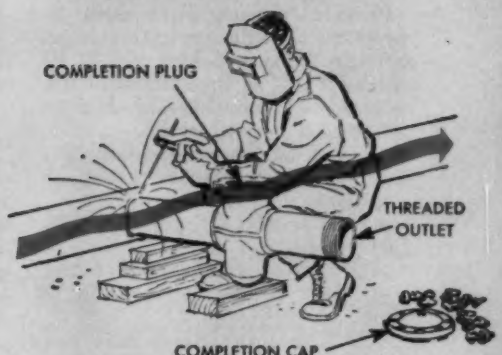
More information is available from John H. Alm, publicity chairman, Room 605, 2 Gateway Center, Pittsburgh 22, Pa.

hot taps without

PROBLEM:

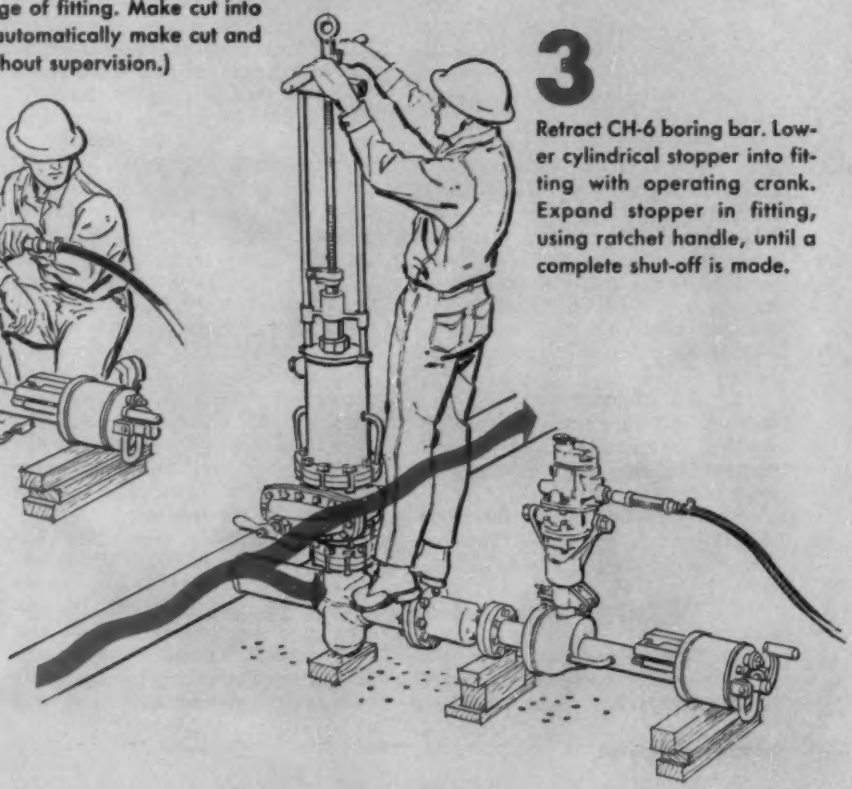
Tie in a new, permanent 6" line to present operating system without interrupting flow. Provide means of valving in new line without installing permanent valves.

HERE'S HOW



1 Weld exclusive Mueller Extension Stopper Fitting to operating line. (6" fitting shown. Other sizes from ¾" to 8" available.)

2 Attach Mueller CH-6 Drilling Machine to outlet of fitting by using companion flange. Bolt Mueller H-17340 Stopping Machine and Gate Valve to flange of fitting. Make cut into line. ("CH-6" will automatically make cut and disengage feed without supervision.)



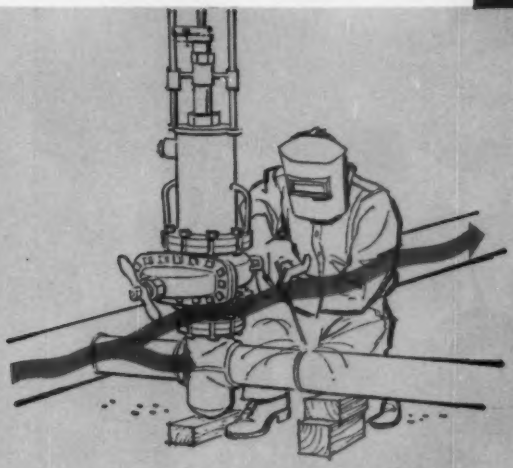
3 Retract CH-6 boring bar. Lower cylindrical stopper into fitting with operating crank. Expand stopper in fitting, using ratchet handle, until a complete shut-off is made.

valves!

ANOTHER IN A SERIES

on applications of

MUELLER® NO-BLO® METHOD

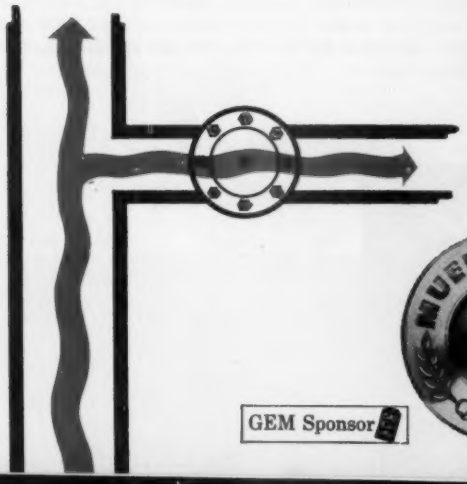


4 Remove CH-6 Machine. Attach new line to fitting and extend to next valve. (Companion flange may be used to connect line or threads may be cut off for welding connection.)

5 Equalize pressure in new line. Contract and raise stopper. Close valve and remove stopping machine. (New piping is now under full pressure.) Bolt Mueller H-17346 Completion Machine to gate valve, open valve and screw completion plug into top of fitting. Remove machine and gate valve and bolt completion cap to flange of fitting.

SOLUTION:

Line has been safely tied in under full system pressure without shutdown or other disturbance to operating facility. Only maintenance-free fitting remains in new line—no valve! Stopping machine may be re-mounted on fitting and line stopped-off whenever needed.



These fittings and machines are just a small part of Mueller's complete system of No-Blo products—products especially designed for use with fluid facilities under pressure.

No-Blo products and methods make it possible to extend dead ends, to transfer service to another line, to isolate a section of line, to repair leaks, to make tie-ins, to run laterals, to install or replace equipment—all under full operating pressure in a safe, controllable manner and without shutdown!

The No-Blo System is typical of the constant attention to detail—and more than a century of experience—in research, design and engineering that is a part of all Mueller fittings and equipment.

Mueller also manufactures a full line of components for water distribution systems, fire protection systems and plumbing systems.

Write for complete information and specifications.

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Where's the Fire?

There isn't any. This spread is using the new CORR-PREV Pipe Coating Team — CHASEKOTE and CHASEWRAP. Pipe is wrapped cold, right from the roll. No fires, fumes, heating or drying time. CORR-PREV high-speed cleaning and wrapping machines apply CHASEKOTE and CHASEWRAP to the pipe in *one* continuous operation. The result: Smaller, faster moving coating crews . . . more footage per day . . . *plus* unequalled under-ground pipe protection at *lowest applied cost!*

Chasekote*

— is a pressure-sensitive, protective tapecoating of *polyethylene*— THE pipe coating material *proved and approved* for its unsurpassed electrical, chemical, moisture and bacterial resistance. Extra-heavy adhesive mass minimizes the need for primer . . . assures fast, permanent tape-to-metal bond.

Chasewrap*

— is an abrasion-resistant, wrinkle-free overwrap that effectively shields against backfill and soil stress damage. Wraps simultaneously with tape. Superior to rag and felt wraps, yet *lower* in cost.

*Trade name of Chase & Sons, Inc., long-famous for protective and insulating tapes for electrical wire and cable.

The New CORR-PREV Pipe Coating Team

Try this new CORR-PREV Pipe Coating Team on your next job. You get all coating items — including high-speed wrapping machinery — from one dependable source. Each roll of CHASEKOTE and CHASEWRAP is factory-uniform in quality and thickness, to give you longer-lasting protection — *and save you money* — every time you place pipe underground! **CHASE & SONS, INC., 26 Spruce Street, North Quincy, Mass.**

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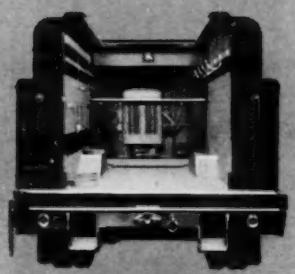
SERIES 850-C

Gas Line Construction and Maintenance Body

Looks like a streamlined warehouse on wheels doesn't it? And, why not—for that's what it is. The 850-C is designed to carry everything (including air) needed for any gas construction or maintenance job. That means plenty of room for hand and pneumatic tools, pipe and fittings, parts and welding equipment . . . name it, and there's a place to carry it in the Series 850-C.

There's plenty of room for a seven-man crew, too—four in the comfortable crew compartment that's part of the body, and three in the truck cab.

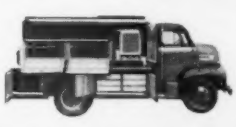
Bodies can be furnished in lengths ranging from 12'3" to 14'3" . . . or without crew compartment in 9' to 12'6" lengths . . . equipped specifically for your job.



Air compressor . . . driven by truck engine through a power take-off, or gasoline-powered . . . can be supplied—with air receiver—in capacity desired.

Hose reels, holding 50 ft. of ¾" high pressure air hose, are installed in lower rear compartments . . . pay-out and take-up hose through openings at rear of body.

CUSTOM-MADE JUST FOR YOUR OPERATION, TOO! Powers-American Series 850-C Bodies, and other standard bodies in the line, can be modified to fit your requirements. Powers-American quality and workmanship is also available in tailor-made bodies . . . built to your specifications or designed by our engineers to meet your specific work needs. Shown here are a few of the hundreds of specially-designed bodies serving operating companies throughout the United States and in many foreign lands.



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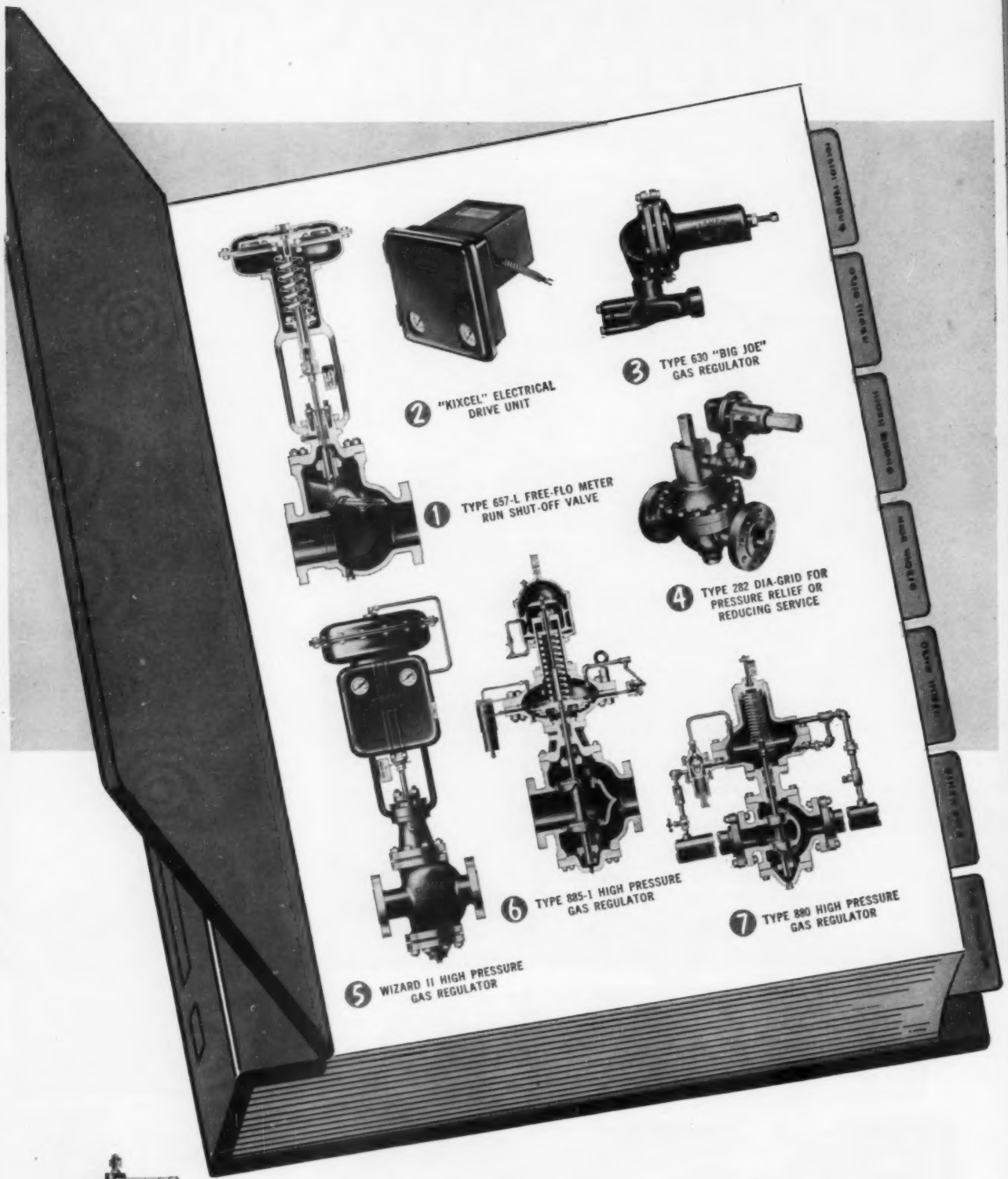
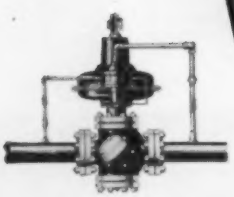

1 TYPE 657-L FREE-FLO METER RUN SHUT-OFF VALVE
2 "KIXCEL" ELECTRICAL DRIVE UNIT
3 TYPE 630 "BIG JOE" GAS REGULATOR
4 TYPE 282 DIA-GRID FOR PRESSURE RELIEF OR REDUCING SERVICE
5 WIZARD II HIGH PRESSURE GAS REGULATOR
6 TYPE 885-I HIGH PRESSURE GAS REGULATOR
7 TYPE 880 HIGH PRESSURE GAS REGULATOR



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The *FISHER/MAN'S* Guide to

SOLVING THE GAS MAN'S PRESSURE PROBLEMS

at Town Border Stations

The normal daily use of gas in the average town or city creates several peaks or valleys in the gas volume needed to meet the demand. At the "City Gate" it's necessary to have properly designed regulators that can dependably maintain the pressure in the line under all demand conditions.

Fisher regulating equipment handles all pressure extremes safely and positively. Fisher is your one source for all town border station gas regulators whether the need is to cut from 1500 or 150 psi. Fisher has exactly the regulator designed for the job. Check the selection below.

1 **TYPE 657-L FREE-FLO METER RUN SHUT-OFF VALVE:** Developed especially for cutting in and out multiple meter service. Provides 100% tight shut-off. Allows full flow with negligible pressure drop with the valve in open position. Can be used for two or more meters where large and variable gas loads are to be measured.

2 **"KIXCEL" ELECTRICAL DRIVE UNIT:** "Kixcel" is the unit for changing the setting of your town border regulator from remote control station by radio or telephone circuit. Can be supplied for remote setting Series 880, 298T or Wizard high pressure regulators.

3 **TYPE 630 "BIG JOE" GAS REGULATOR:** Ever popular "Big Joe" frequently used on small border stations and service taps from high pressure transmission lines. Suitable for inlet pressures up to 1500 psi and for reduced pressures from 3 to 200 psi.

4 **TYPE 282 DIA-GRID FOR PRESSURE RELIEF OR REDUCING SERVICE:** Using an expansible element, the pilot loaded Dia-Grid ideally suited for town border stations requiring positive shut-off and large capacity. Can be supplied with pilot loader for relief service for pressures up to 750 psi and with pilot loader for pressure reducing service with inlet up to 500 psi and reduced pressure up to 200 psi.

5 **WIZARD II HIGH PRESSURE GAS REGULATOR:** Widely used for first stage reduction because of its flexibility and wide range of adjustments. Available for remote mounting or on yoke of control valve. Wide proportional band adjustment. Can be supplied with reset response. Can be supplied with spring closed or spring opened control valve.

6 **TYPE 885-1 HIGH PRESSURE GAS REGULATOR:** Designed to handle uncommonly rough jobs that involve high pressures up to 1000 psi, reduced pressures up to 450 psi. Oil dash pots prevent inner valve vibration or jump while operating in a high pressure, high capacity system.

7 **TYPE 880 HIGH PRESSURE GAS REGULATOR:** Handles inlet pressures up to 600 psi. Designed to deliver outlet pressures ranging from 1 psi to 250 psi. High tensile diaphragm casing withstands high emergency loading pressures up to 300 psi.

FISHER® Controls

SINCE 1880

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

INTRODUCING **SHORT NEW**

CHEVROLET TILT CAB TRUCKS

72" BUMPER TO BACK OF CAB

They're built like "tilts" should be built—that's the story on this new line of trucks from Chevrolet. All of the special advantages of tilt cab design—compactness, extra payload capacity, easy maintenance, maneuverability—are better than ever before. And Chevy brings you some extra-special benefits, too!

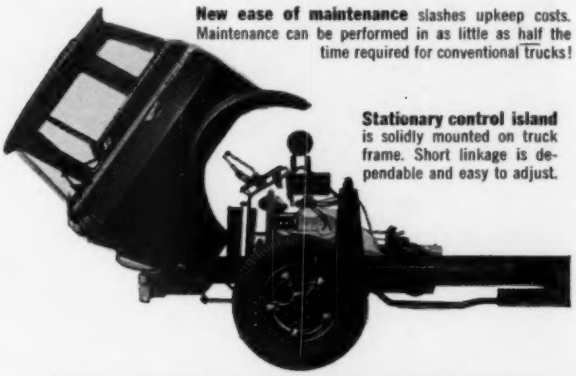
MOST COMPACT IN ITS CLASS for higher profit payloads. Six-foot-bumper-to-back-of-cab dimension gives you more cargo space than ever before (almost 60 cubic feet more than other tilt cab trucks!). You can carry bulkier payloads in a bigger body; and you can carry *heavier* payloads, too, because the extra space means more of the load weight can be carried by the front suspension. This *shorter* design means longer profits!

BEST MANEUVERABILITY. With comparable body sizes, new Chevrolet tilt cabs are as much as 2½ feet shorter overall than conventional models and save up to 48 inches in wheelbase. This *minimized* length and wheelbase pay off in *maneuverability*—easy handling in tight places that will save you time and work every day.

ROOMIEST CAB in its class! New Chevy tilt cabs are big and comfortable inside. A full 6½ feet wide, with plenty of head room and leg room for rangy drivers. And there's the safety of "picture window" visibility through a sweeping glass area.

REVOLUTIONARY TORSION-SPRING RIDE standard in all models! Independently suspended front wheels step nimbly over bumps . . . and friction-free torsion bars soak up jolts of all sizes. New variable-rate rear springs complement the new front suspension perfectly. The result is an amazingly smooth ride that assures higher safe cruising speeds, more work done every day . . . plus longer truck life with lower maintenance costs.

And in every new Chevy tilt cab model, new tougher built rear axles and brawny new box-section side-rail frames team up with the best kind of big truck power.



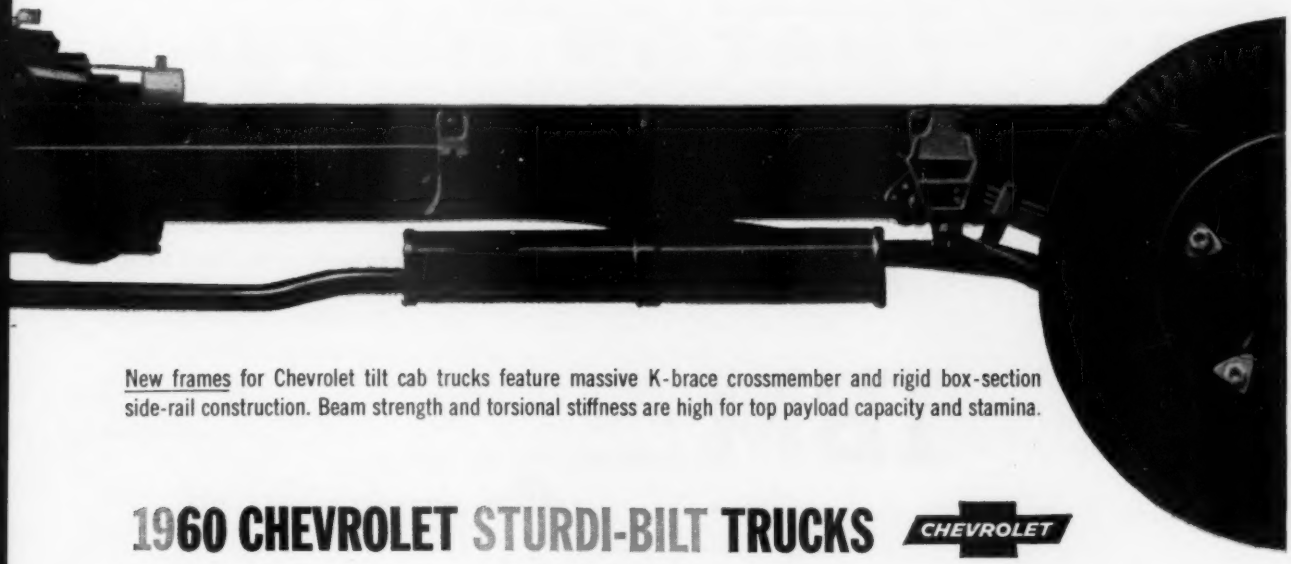
New ease of maintenance slashes upkeep costs. Maintenance can be performed in as little as half the time required for conventional trucks!

Stationary control island is solidly mounted on truck frame. Short linkage is dependable and easy to adjust.

Torsion-spring tilting hinge takes the work out of tilting. A tough torsion bar counterbalances the cab's weight and makes cab tilting a breeze.

Triple-safe locking system provides protection against accidental tilting. Keeps cab securely anchored down when you're under way.

20 NEW MODELS IN 5 SERIES. Five rugged medium- and heavy-duty series offer G.V.W.'s up to 25,000 lbs. Money-saving power is provided by Chevy's famous truck-built engines—economy-minded 6's for all models up to 22,000 lbs. G.V.W. and tough V8's for bigger models. Chevy makes tilt cab design *work* like never before; you can see for yourself by visiting your Chevrolet dealer right now! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

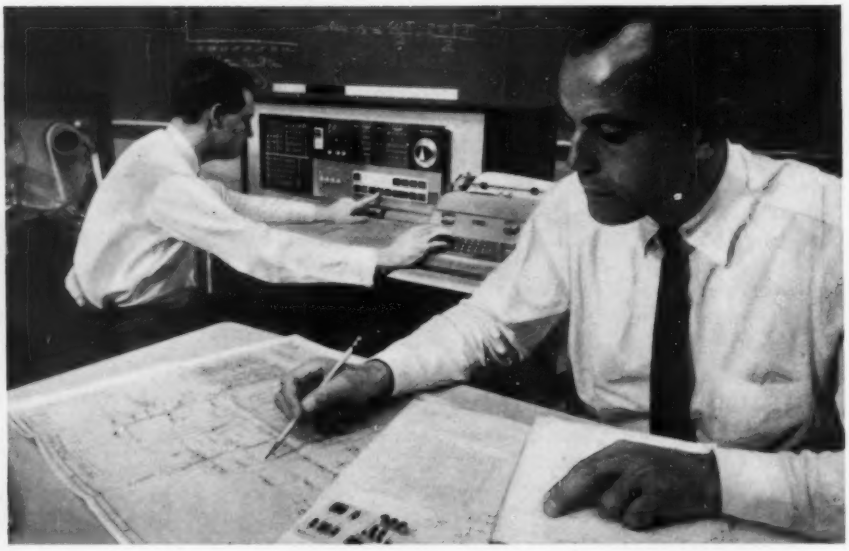


New frames for Chevrolet tilt cab trucks feature massive K-brace crossmember and rigid box-section side-rail construction. Beam strength and torsional stiffness are high for top payload capacity and stamina.

1960 CHEVROLET STURDI-BILT TRUCKS CHEVROLET

IBM 1620 *data processing system*

...the most powerful engineering computer in its low price class



In the Gas Industry the IBM 1620 solves problems like these:

- *network analysis*
- *pipe line design and simulation*
- *compressor performance analysis*
- *statistical load trends*

The new IBM 1620 is a desk-size engineering computer that offers you more computing ability per dollar than any system in its price class.

Transistorized throughout, the IBM 1620 has a 20,000-digit magnetic core memory with variable field length and immediate accessibility. Its input-output notation, on paper tape and console typewriter, is in convenient decimal arithmetic. It can perform more than 100,000 calculations a minute and is easily adapted to your engineering problems.

Easy to learn, easy to operate, easy to communicate with, the low-cost 1620 helps free your engineering talent for more creative work. And in keeping with our concept of Balanced Data Processing, the IBM 1620 is supported by extensive services. This includes a comprehensive library of mathematical routines and specific industry programs to permit you to put the 1620 to work without unnecessary delay.

Ask your IBM representative about the unique advantages of the IBM 1620. Like all IBM equipment, it may be purchased or leased.

IBM® *balanced data processing*

JAEGER ROTARY "75"

the ideal compressor for "one breaker" work

EASY STARTING IN ALL WEATHER because it's a rotary. No piston drag.

COSTS LESS YET RUNS SMOOTHER than the reciprocating type it replaces. Puts out cooler air, too.

JUST RIGHT FOR AN 80 LB. BREAKER. 75 cfm of air runs a heavy duty tool at top pressure and efficiency.

FULLY EQUIPPED with automatic blow-down valve, tool boxes big enough for full set of tools, spring-mounted truck for fast trailing.

Saves money, spares effort, speeds work. See your Jaeger distributor or send for catalog.

THE JAEGER MACHINE COMPANY, 661 Dublin Avenue, Columbus 16, Ohio

AIR COMPRESSORS, 75 TO 900 CFM • PUMPS • MIXERS • TRUCK MIXERS • PAVING MACHINES

LARK'S A "NATURAL" ON GAS

Case history from a company in the Ohio fields: "20 miles per gallon on our V-8 Larks, 23 miles on Lark 6's with overdrive. ➤ We also save significantly on lower insurance, lower oil consumption, less parking space. ➤ We are interested in good transportation at a reasonable initial cost. We are impressed with the economy in operating Larks. ➤ Comments from our representatives driving Larks are very encouraging. They are very much surprised and impressed with the ease of handling, the maneuverability, etc." ➤ *This company will not permit the use of its name, but their report is in our files at South Bend.*

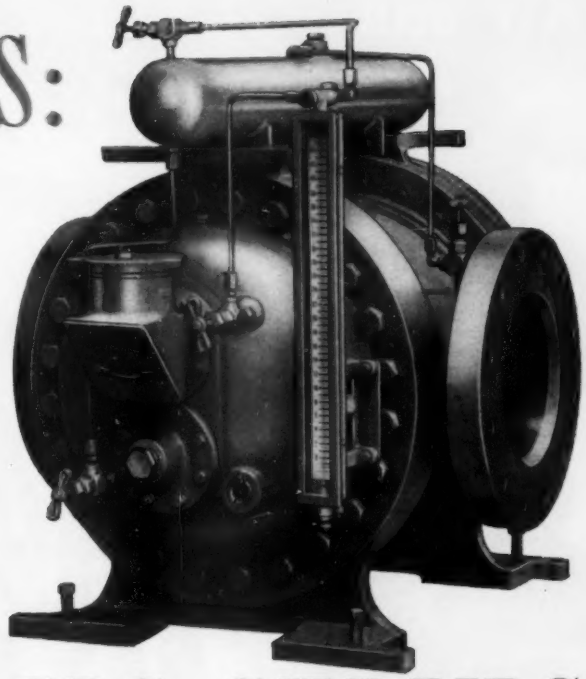
Budget-wise buyers
LOVE THAT
LARK
BY STUDEBAKER

TELL US MORE ABOUT LARK SAVINGS!
Fleet Sales Division, Studebaker-Packard Corp., South Bend 27, Indiana
( ) Send us informative literature only
( ) Have a factory representative call me for an appointment

NAME _____
PLEASE PRINT
TITLE _____
COMPANY _____
ADDRESS _____

R-C PRESENTS:

a new line of high-pressure rotary gas meters



FOR 600 PSIG SERVICE

A new line of 600 psig rotary positive displacement gas meters has been developed by Roots-Connersville to serve the needs of industries requiring extreme measurement accuracy in the higher pressure ranges. The meters are available in 4 sizes covering a range of from 84,000 to 1,600,000 scfh.

THIS NEW METER LINE IS IDEAL FOR MANY APPLICATIONS:

- City Gate Metering
- Transmission Line Metering
- Process Gas Metering
- Chemical Gas Manufacturing
- Gas Lifting
- Compressor Stations
- Well Head Measurements
- Steel Mills
- Underground Storage
- Metering of pulsating flow and surges, H2, 02, C02, NH3, LP gas, NO, He, C2H2, etc.

R-C rotary gas meters require an absolute minimum of maintenance . . . assure almost complete freedom from wear . . . exceptionally high accuracy in metering. A refinement of the basic R-C rotary-positive design which has proved its dependability over the years. These new meters for 600 psig service have incorporated simple in-the-line mounting, straight through flow . . . high-speed gears . . . and a welded steel outer case enclosing a steel inner cylinder. Throughout their extra wide operating range, these new R-C meters assure greater accuracy and improved performance in handling a wide variety of gases.

The development of this new meter is another example of R-C's specialized experience of more than 100 years in the design and application of air and gas handling equipment.

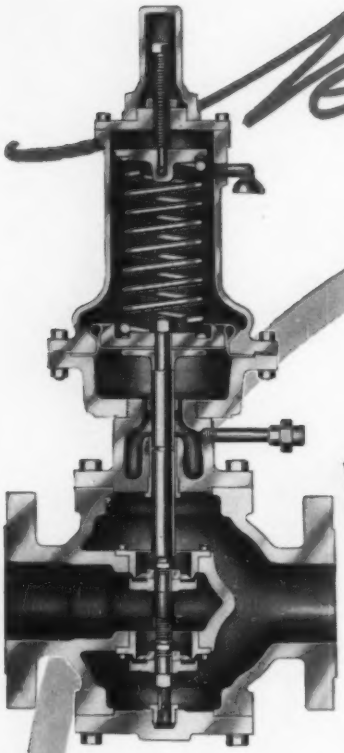
Write us for additional information and data sheets about these new Roots-Connersville meters for 600 psig service.

ROOTS-CONNERSVILLE BLOWER
DIVISION OF DRESSER INDUSTRIES, INC.
260 Oregon Avenue, Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto

New in principle!

CHAPLIN-FULTON

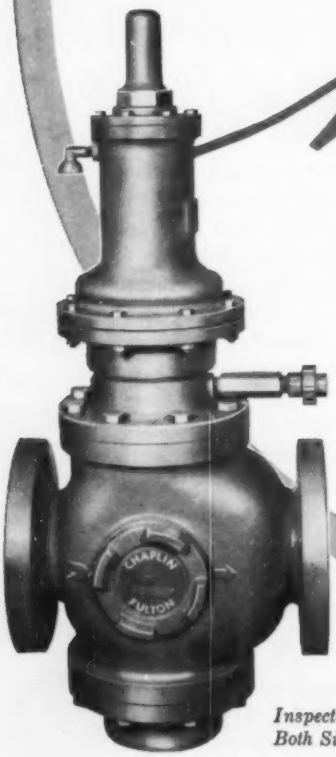
MODEL 441-57S GAS REGULATOR



SIZE: 2"—3"—4"—6"
125 lb. iron—W. P. 175 psi
250 lb. ductile—W. P. 400 psi
Series 30 steel—W. P. 720 psi

Model 57-S, a simple spring loaded regulator, operates on a new diaphragm principle which will control accurately until the regulator is wide open. The outlet pressure "fall-off," typical of spring regulators, is eliminated—not by an uncontrolled velocity effect—but by a diaphragm which changes its size as the valve moves to give straight line control. For pounds-to-pounds service,—controlled pressures to 75 psi with same assembly.

New in design!



Inspection Plates Both Sides.

Also, a new body design—441—with gas exit areas greatly enlarged to prevent turbulence and increase capacity.
And to help in your visual inspection program—side inspection plates on *both* sides of the body have been included. Screwed-on with O-ring seal, they can be quickly removed and replaced—no gasket problem. Standard face-to-face dimensions now make the 441 interchangeable with other regulators.

ACCURATE CP MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania

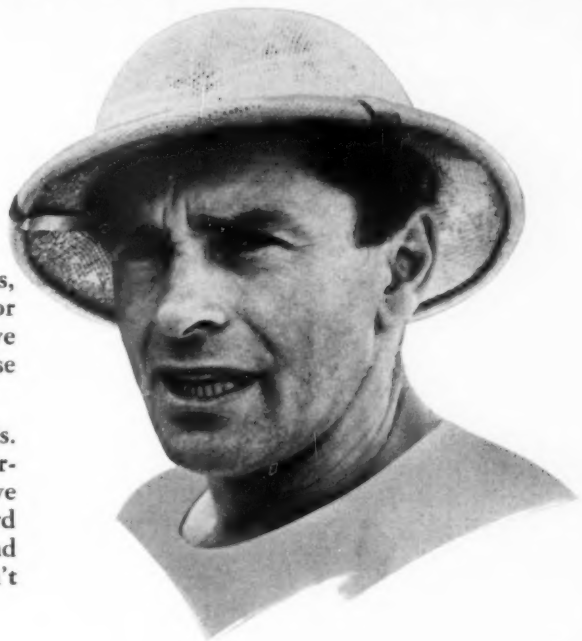
59-2

4 who bought Ford Tractors . . . and *WHY*

"Price"

says *Jackson*

president of "Pools of Distinction,"
Jacksonville Beach, Florida.



"We style and custom build swimming pools of all sizes, 15′ x 30′ and up," says Mr. Jackson. "Our Ford tractor digs and shapes the cavity with a backhoe. Then we use the loader to stack earth around the walls and raise the pool level.

"We figure Ford saves us over $100 a pool," he adds. "We're very pleased with our dollar savings in operation and maintenance costs. But these were benefits we learned about by experience. What attracted me to Ford in the first place was price. Comparing features and work capacity with others on the market, I couldn't find anything else to match Ford."

PRICE? THESE ARE THE FACTS WITH FORD*

Ford Workmaster Tractors—$330 Under Average

(Comparison power range—34 to 47 engine HP)

Ford Model 621 tractor's retail list price is $63 less than its nearest competitor among 10 other utility tractors, and $330 less than the average price for all 10—seven of them having less than Ford's 45 engine HP. Ford's price of $48 per engine HP is $5 less than its nearest competitor, and $13 less than the average for all 10.

Ford Powermaster Tractors—$1,138 Under Average

(Comparison power range—51 to 72.5 engine HP)

Ford Model 821 tractor's retail list price is $667 less than its nearest competitor among five other utility tractors, and $1,138 less than the average price for all five. Ford's price of $39 for each of its 62.5 engine HP is $12 less than the No. 2 tractor, and $19 per HP less than the average for all five.

Ford Diesel Tractors—$409 Under Average

Diesel engines are a factory-installed option for all series of Ford tractors. In each power class, Ford costs less than all comparably equipped competitors. Each Ford diesel option costs only $420 more than the same Ford tractor in a gasoline model. Among the nine other more popular diesel tractors, the average mark-up for diesel as compared to gasoline models is $829. Ford's mark-up is $409 less than the average for these other diesels, and $130 less than its nearest competitor.

Ford Industrial Tractors—$474 Under Average

(Comparison power range—51 to 72.5 engine HP)

Ford Model 1821 tractor's retail list price is almost the same as one other industrial tractor in its power class ($3 less, to be exact), but it is $474 less than the average price of the five others in this class. Ford's price of $49 per engine HP is a dollar less than the No. 2 tractor and $8 less than the average for all five. Perhaps even more important, when all of these units are equipped with loaders, Ford is first in breakaway, a close second in rated lift capacity and the leader by a big margin in overall productivity. Ford moved 13 tons of material an hour more than its nearest tested competitor!

*All comparisons are based on tractors equipped comparably to the Ford models cited. Retail list prices are F. O. B. factory and will result, of course, in variations of delivery price according to point of purchase. Comparisons are based on the most recent published data held by Ford at the time of printing, and are believed to be an accurate reflection of suggested retail list prices before addition of shipping charges, state taxes, etc.

4 who bought Ford Tractors . . . and *WHY*

"Dependability"

says *John A Behnken*

president of Behnken Coal and Materials Company of New Athens, Illinois.

"One operator with Ford loads out 200 tons of limestone in 8 hours," Mr. Behnken says. "That's a $600 payload and twice the amount four men used to load in four days. Ford loading efficiency saves coal customers $1.40 a ton. And we gain at least 50c a ton price advantage on quarry materials because fast loading lets us stockpile.

"But probably the biggest thing to me—the reason I'll always buy Fords—is dependability. I've got one tractor 14 years old and another one 10 years old. They've averaged 25,000 tons of rock, sand and limestone, and 6,000 yards of dirt a year ever since.

"Both have been in constant service and with just about everybody among our 30 people operating them at one time or another," he continues. "Yet we've never had a major repair and never had a parts replacement involving either engine!"

DEPENDABILITY? THESE ARE THE FACTS WITH FORD

Over Two Million Ford Tractors

In manufacturing as in most other fields, there's no substitute for experience to produce machines giving the years of dependable performance described by Mr. Behnken and thousands of other Ford tractor owners. Ford has more tractor experience than any other company, today is well on the way toward its three-millionth tractor.

World's First Mass-Produced Tractor

In 1917 the world saw its first Fordson. During the next decade it saw more than 700,000 of them—some three-fourths of all U.S. tractor production. In 1939 Ford introduced built-in hydraulic systems with its model 9N Ford tractor. Sixteen years later Ford produced its one-millionth tractor with revolutionary three-point hitch and hydraulic system.

Birth of the "Red Tigers"

In 1952 Ford produced the first of the "Red Tiger" engines which still today are such a vital part of Ford tractor dependability, Since that time—more than three-quarter million engines ago – they've been refined, given more power, improved in many ways. But each has added to the Ford fund of experience which goes into the production of today's—and tomorrow's—Ford tractors.

Only Tractor Maker with Auto Experience

Ford is the only member of the tractor field with ready access to the production experience, the depth of research and the foresighted engineering of the auto industry. Ford's new and exclusive Select-O-Speed transmission, for instance, drew heavily on the experience gained with planetary gearsets in many millions of Ford autos. Ford Tractor and Implement people are quick to adapt all proven processes and economies to their own production . . . benefits which loom big among the many reasons for Ford's consistently high quality, Ford's traditional low cost.

4 who bought Ford Tractors . . . and *WHY*

"Versatility"

says *Carroll Blackden*

president of Krete Kraft Concrete Products Company of North Hampton, New Hampshire.

"Our Ford tractor and loader paid for itself in less than a year," says Mr. Blackden, whose company is the largest producer of concrete septic tanks in New England. "It enabled us to handle easily a 20% increase in production.

"Considering the constant heavy use this Ford tractor gets, it is a real tribute to its rugged design that our maintenance costs have been so very small. But I believe the biggest Ford feature is versatility. Our tractor works about half-time loading aggregate and pouring cement, about half-time storing and truck-loading distribution boxes, tank covers, etc.

"In addition," Mr. Blackden says, "the unit is used for occasional work in home construction, and for snow removal at the plant about 10 days a year. It's the steadiest worker on the job and the most versatile piece of equipment we have."

VERSATILITY? THESE ARE THE FACTS WITH FORD

Wide Range of Tractors

Ford offers a line of tractors with power and equipment for almost any materials handling or grounds maintenance job. Six different Workmasters, five Powermasters and five Ford Industrial tractors—all with diesel engine options which in effect double the selection to 32 models. They range from Special Utility models—for drawbar operations and work not needing hydraulic systems—up through fully equipped tractors with the new Select-O-Speed transmission and two-speed power take-off. Ford also offers Utility and All Purpose models of the big Fordson Power Major Diesel, the new Fordson Dexta Diesel, and both Standard and High Clearance models of the new Ford Offset tractor for nurserymen and landscapers. With Ford you choose your weight, your power, your tractor equipment and your work capacity . . . select exactly the right tractor for *your* job.

Wide Range of Basic Attachments

You'll find exactly the right Ford attachment for your job, too. Loaders with 1,000 to 2,500-lb. rated capacity; 10 ft., 12 ft. and 14 ft. backhoes; 6′ or 7′ front and rear blades; 65″ to 80″ rollover and box type scrapers; tiller rakes; 60″ and 100″ rotary cutters; 6′ and 7′ cutter bar mowers; 6′ and 8′ lime and fertilizer spreaders; cordwood saws, posthole diggers and many other attachments designed to save time, men and money on dozens of jobs.

And an Ever-Growing List of Specialized Equipment

Your Ford Tractor and Equipment dealer also sells many other attachments for Ford tractors. Brooms, winches, fork lifts, air compressors, side booms, sprayers, aerating tools, rollers, trenchers, pumps, reel mowers, compactors, portable welders . . . the list seems almost endless, and in almost every case fulfills a real need in replacing costly hand labor. Just give Ford a try. You'll soon find it's the busiest worker on your job.

4 who bought Ford Tractors . . . and *WHY*

"Service"

says *Carmen Oliver*

partner, Oliver Bros. Landscaping of Tonawanda, New York.

"We take over landscaping jobs two or three inches from finished grade," Mr. Oliver says, "and spread top soil, rough grade, backfill foundations, finish grade, seed and fertilize. Three Fords with loaders, blades and other attachments are operated 10 to 12 hours a day, six days a week.

"Ford has cut our operating costs at least 50%," he adds, "and in 24 years of operation—the combined total of the four Fords we've owned—we've never yet had any significant down time.

"We practice our own preventative maintenance and dealer service is seldom needed. When we *do* need our dealer, though, he always comes through for us. The service is excellent and you can understand how important that is to us when you watch how much Fords are a part of our day-to-day operation. We just couldn't afford any major down time."

SERVICE? THESE ARE THE FACTS WITH FORD

Wherever You Are, Ford's Not Far

In every state, in almost every county in the United States, there's a dealer, distributor or manufacturing plant for the Tractor and Implement Division of Ford Motor Company. You're only a few hours, at most, from dealer parts stocks . . . only a phone call away from the even bigger stocks held in reserve by Ford's 29 Distributors and Sales Districts.

Ford Reputation on the Line

When you buy Ford tractors and equipment, you also receive the "job security" of an authorized Ford Tractor dealer's parts and service warranty. You're also buying the future bonus of Ford's excellent trade-in values.

See Your Dealer Soon

These are just a few of the many reasons why Fords are replaced with Fords, and why more companies add Ford to their equipment every week. Owner satisfaction stems not just from the product, but to a large extent from the man who sells it and keeps it working. Have you talked to your Ford Tractor and Equipment dealer lately? He's selling the most basic job needs—economy, dependability, versatility and service. He's selling satisfaction. Get yours right away!

TRACTOR AND IMPLEMENT DIVISION • FORD MOTOR COMPANY • BIRMINGHAM, MICHIGAN

Ford

INDUSTRIAL TRACTORS AND EQUIPMENT

Now there's a New "Jeweled" Escapement in ROCKWELL CHART DRIVES

for greater accuracy and longer life

This jeweled movement brings fine watch quality to instrument timing

SPEED CHANGING TURRETS PROVIDE SEVEN DIFFERENT ROTATION RATES

The basic Rockwell Chart Drive has a main arbor rotation rate of 7 days. Economical snap-on turrets permit changing to 8-day, 15-day, 16-day, 24-day, 30-day, 31-day, and 24-hour rotation. No tools or special skills are required. You can even change chart rotation without removing the drive from the instrument.

The introduction of a jeweled movement—the first ever used on a general industrial timing device made in the United States—makes the Rockwell more accurate than any unjeweled chart drive could possibly be. In addition to offering fine watch quality, the jeweled escapement requires less power to operate and is extremely durable, since seven hard jewel surfaces are provided to limit friction and wear.

You will benefit in many ways by using these jeweled movement chart drives for powering all your recording instruments. They adapt readily to fit into practically any instrument case while speed-changing turrets (see left) permit changing rotation rates at will. Write for full information. Rockwell Manufacturing Company, Instrument Division, Pittsburgh 8, Pa.

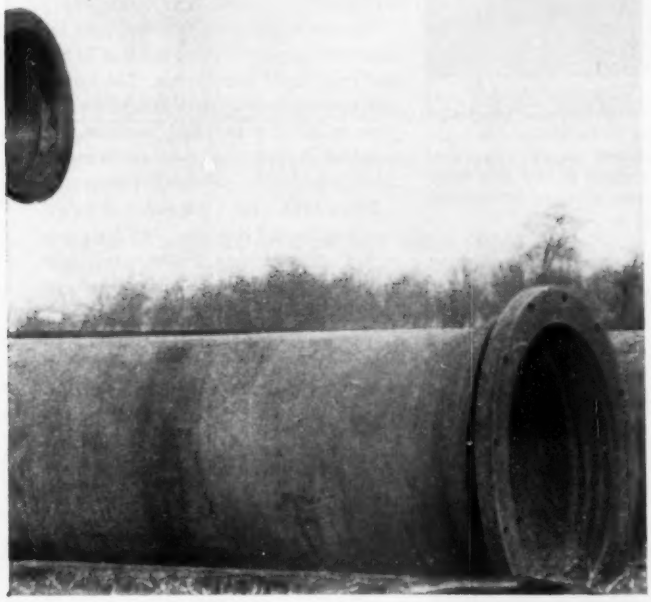
JEWELED CHART DRIVES

another fine product by

ROCKWELL

THE MARK OF THE 100-YEAR PIPE

IF YOUR DECISION MUST STAND UP FOR 100 YEARS...



Rely on cast iron pipe. Gas utility executives throughout the country know they can depend on cast iron pipe. Here's why:

- Cast iron pipe is inherently rugged; its tough construction offers service-free efficiency for years.
- Once cast iron pipe is in the ground, *it stays there!* Forty-five American cities are still using cast iron gas mains that were installed over a century ago.
- Modern mechanical joints remain tight under normal distribution pressures.
- Cast iron pipe withstands all the usual stresses to which underground pipe is normally subjected.

Save—with cast iron pipe

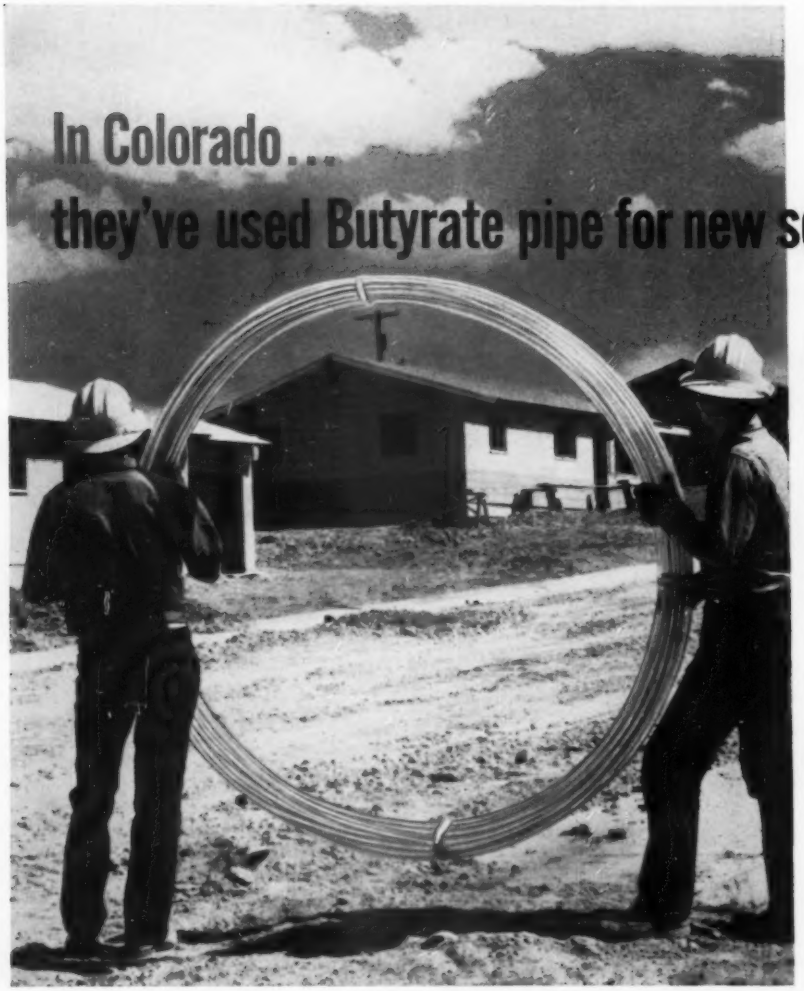
Although original estimates might indicate that other pipe is initially cheaper than cast iron pipe, there are other considerations! Cast iron pipe's durability and corrosion-free service make for *real* savings over the years!

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza Chicago 1, Illinois

...good reasons for <u>you</u> to choose

CAST IRON PIPE

In Colorado... they've used Butyrate pipe for new services since 1951



A field crew of Public Service Company of Colorado installs a new service line using pipe of Tenite Butyrate. Butyrate's superior flexibility permits this pipe to be shipped in coils, which often means that service lines may be one continuous length with no plastic-to-plastic joints. (An AGA report recommends that only Butyrate pipe be shipped in this convenient manner.) Crewmen appreciate the ease with which lightweight Butyrate pipe may be handled. Plastic-to-metal joints are made quickly, and this tough pipe needs no "babying."

For nearly a decade, Public Service Company of Colorado has cut costs with service lines of Tenite Butyrate plastic

Public Service Company of Colorado is among the leaders in the current trend towards the use of plastic pipe in the gas industry. Its engineers first experimented with Butyrate plastic pipe back in 1951 and have been using it ever since, not only for service inserts but for new services as well. The fact is, *over 50% of the Butyrate pipe used by this utility goes into new services.*

The advantages of Butyrate pipe for new services go beyond the low initial cost and rapid installation. The corrosion potential of a system using Butyrate pipe is greatly reduced, resulting in substantial long-term savings in maintenance and better service to customers.

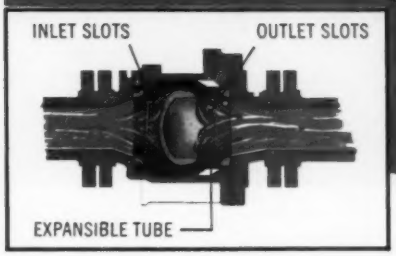
Since 1943, over 1,000 miles of Butyrate pipe have been installed by three major utilities alone. It's the first choice in plastic pipe among major natural gas distributors.

Investigate the many advantages of pipe of Tenite Butyrate for new service lines, service inserts or mains. For further information plus a list of extruders of Butyrate pipe, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

TENITE®
BUTYRATE
an Eastman plastic

GROVE FLEXFLO

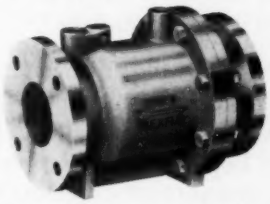


The world's most versatile valve has only one moving part, yet can be used for:

A single, moving part—an expansible tube of tough, but resilient rubber—serves as both diaphragm and valve. Can't slam... the tube rolls on and off the core, assuring remarkably quiet operation. Can't stick or wedge open. The resilient tube seals around foreign matter... absolute shutoff every time. Simple design guarantees dependability and minimum maintenance. Highly sensitive with smooth, instantaneous response.

The Flexflo can be adapted for a wide variety of services. May be self-operated or used with electrical, pneumatic or hydraulic-actuated pilots. Can handle gases, water, most petroleum products, and numerous other liquids... available in sizes 1" to 12" ... working pressures to 1500 pounds.

PRESSURE REDUCING
REMOTE CONTROL OPERATIONS
BACK PRESSURE CONTROL
AUTOMATIC SHUTOFF
MANUAL OPEN-SHUT FLOW CONTROL



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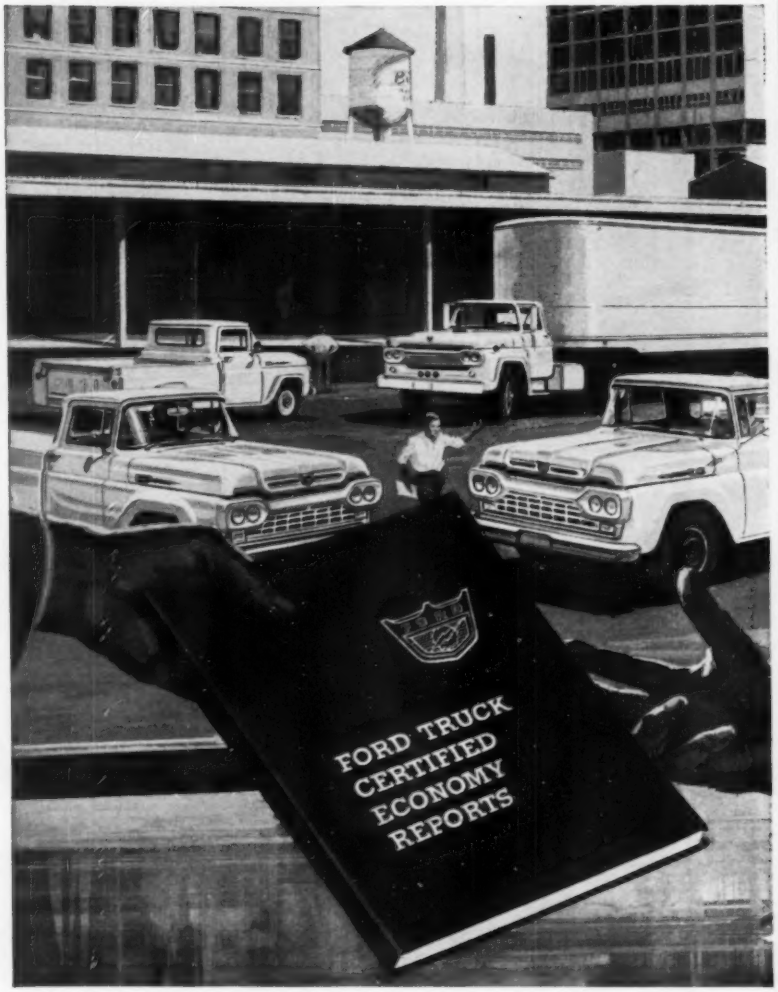

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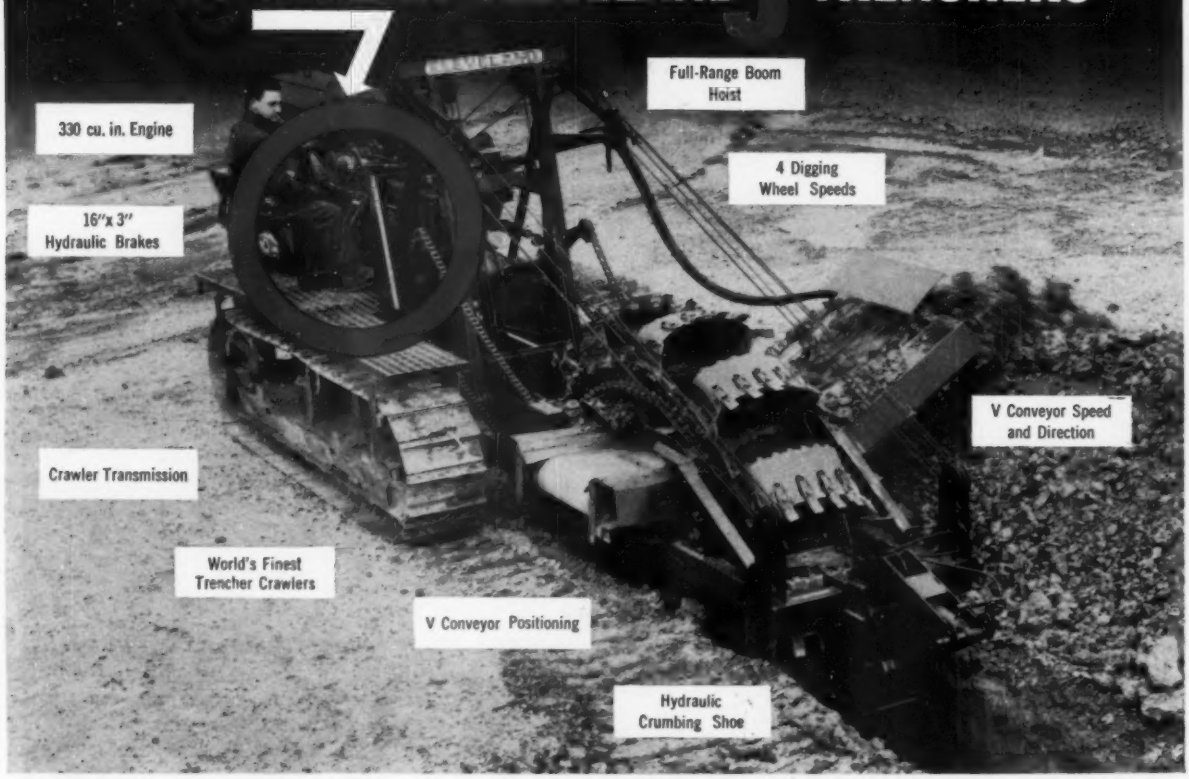

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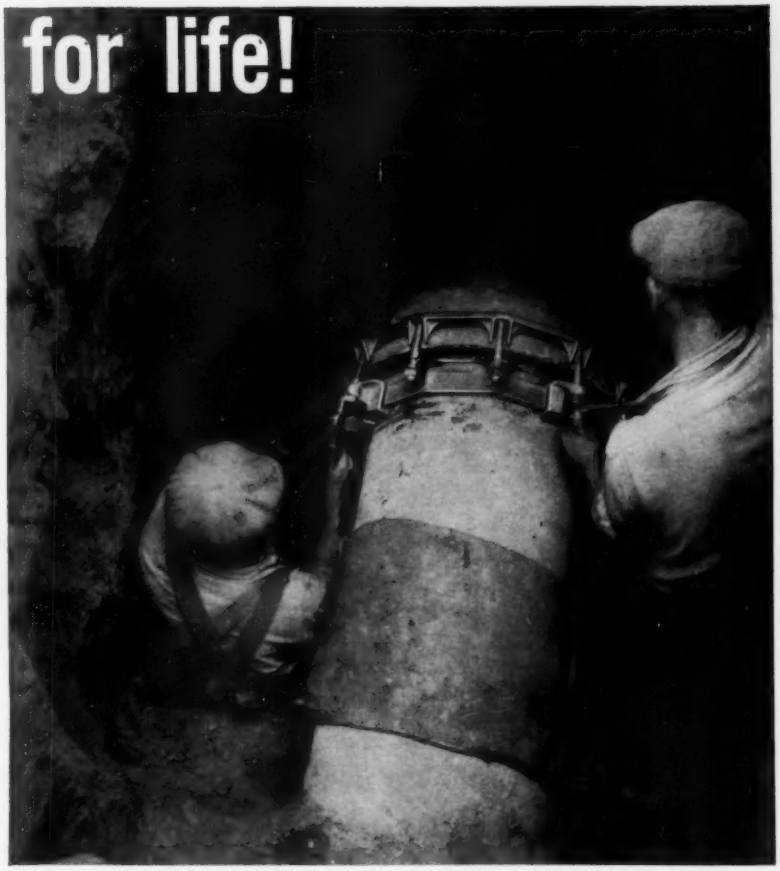

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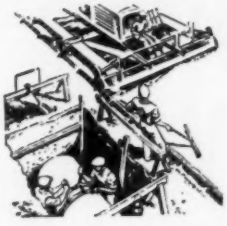

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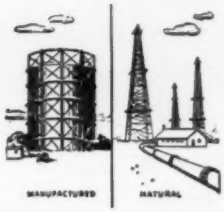
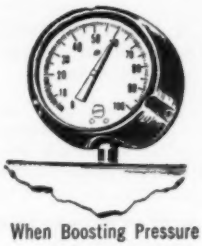
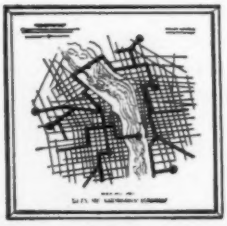


When Switching from Wet to Dry Gas



When Boosting Pressure



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14" & 16"	3—XL-60 Units
18" & 20"	4—XL-60 Units
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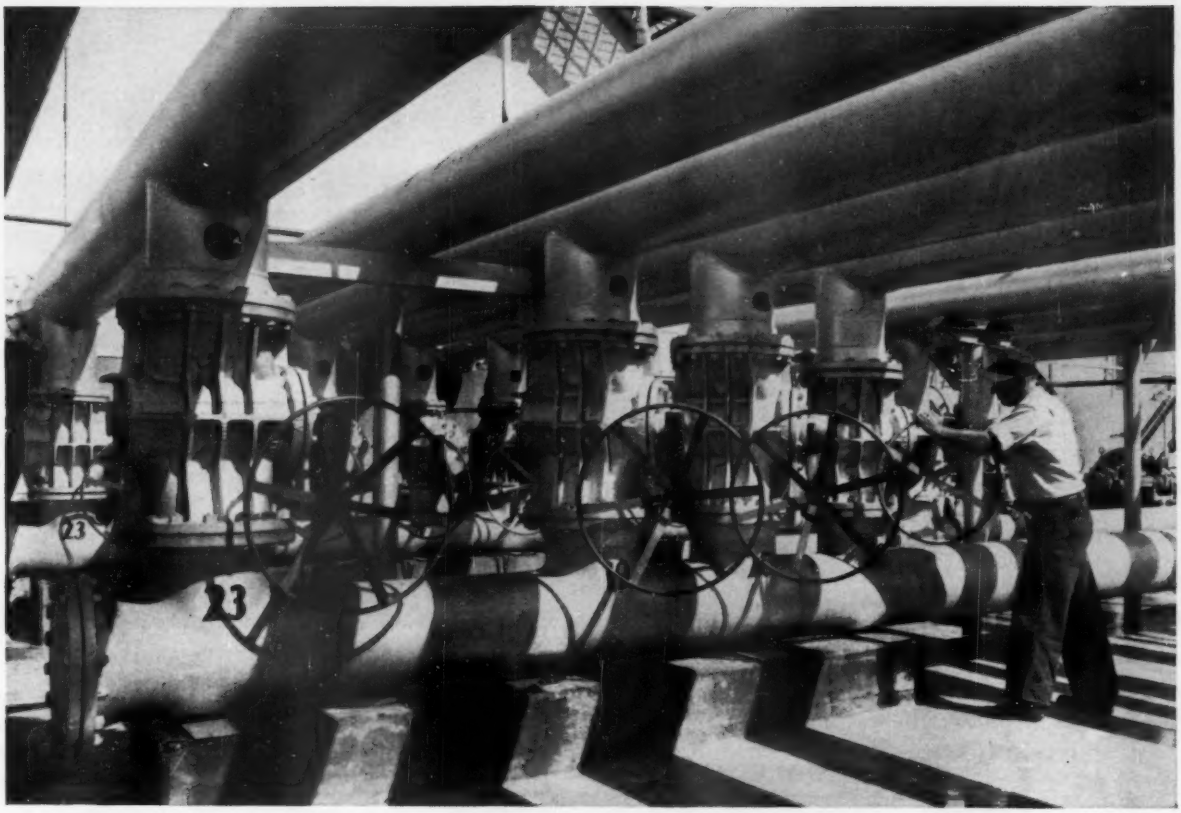

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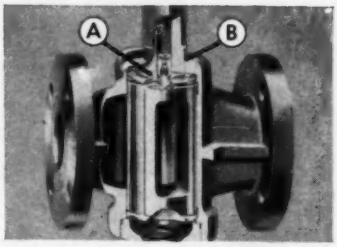

Cross-section of Homestead Lubricated Plug Valve. Triple head seal (A) prevents leakage. Tell-tale lubricant ring at (B) signals full system, prevents waste of lubricant and contamination of line fluids.

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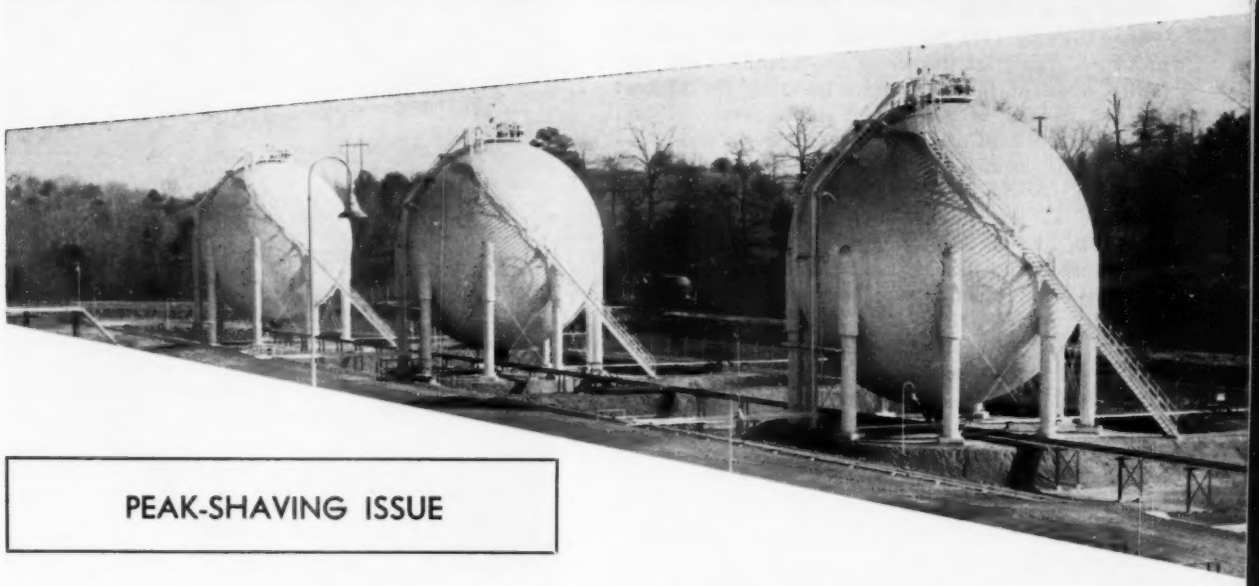


PEAK-SHAVING ISSUE

Alabama Gas uses

Large volume refrigerated storage

By T. G. HUMPHREYS, Jr.
Assistant Chief Engineer
Alabama Gas Corp., Birmingham

and

F. A. FAULKINBERRY
Rust Engineering Co.
Birmingham

ALABAMA Gas Corp. decided early in 1957 that added propane-air plant facilities would be required for peak shaving cold weather demands on its ever-growing system. The company serves 49 Alabama communities with natural gas. In line with this decision, it was decided to install a propane-air plant, using large volume refrigerated storage at Montgomery, Ala., where peak-shaving facilities had not been used before. This plant would serve not only its primary peak-shaving purpose, it would also provide a proving ground for some new concepts in design and operation of a large scale plant which would later be constructed in the Birmingham area where the gas sendout is several times that of Montgomery.

Alabama Gas engineers then teamed with the Rust Engineering Co. to design the Montgomery plant, which was placed into operation in February, 1958, and the Birmingham plant, which began to produce gas in November, 1958. Alabama Gas constructed the plant at Montgomery. The larger facility at Birmingham was built by Rust Engineering Co.

For several years Alabama had been peak shaving in Birmingham, using a propane-air plant and stored gas from several holders. The new plant at Birmingham, shown in *Fig. 1*, is located on a 55-acre tract of land which includes two parallel ridges and a draw between. One of the primary reasons for selecting this site was that one of the main natural gas feeder lines serving Birmingham runs very close to the site. The site was made even more desirable by the presence of a main railroad line along one edge of the property.

The property was very rough and required considerable earth work. But it ultimately proved to be almost ideal for such an installation: The storage facilities could be placed in the draw and other plant units at higher elevations on the sides of the ridges.

The plant has a basic design sendout capacity of 18 MMcf per day of a 1350 Btu per cf propane-air mixture, at a delivery pressure of 160 psig. In natural gas equivalent this amounts to approximately 23 MMcf per day. Liquid propane storage capacity is

Above is a general view of storage area showing three spheres, each with a propane storage capacity of 480,000 gal.

about 1.44 million gal. in three Hortonspheres. The plant is so designed and laid out that the production capacity may be increased about 50 per cent by adding units to the original installation or be approximately doubled by paralleling the original plant. Space is available to increase storage facilities by adding more spheres.

In designing this plant, every effort was made to provide a maximum degree of dependability and flexibility while at the same time insuring the highest possible degree of safety for both personnel and equipment. All of the units that handle and store propane are located at the lower elevations on the plant site because heavy propane vapor tends to accumulate at low places. The storage spheres are located in line on approximate 190-ft centers. Each sphere has at its base a moat capable of containing the entire liquid contents of each sphere in event of a sphere rupture. This safety measure is thought to be fully justified even though the possibility of rupture is extremely remote.

All of the electrical apparatus in the storage area is explosion-proof, meeting or exceeding the requirements of the NFPA. The storage and refrigeration areas are equipped with a leak detector system which automatically sounds an alarm at the plant and at the company's gas system control office several miles away.

The plant generally consists of two areas—one containing the storage facilities and the other the gas production equipment. The storage area has a railway spur track with an unloading station for each of the three Hortonspheres, the storage spheres themselves, and refrigeration equipment for maintaining proper propane pressure in the storage vessels. Propane liquid pumps, which are, of course, a part of the production facilities, are also installed in the storage area.

Each propane unloading station located on the railway spur track can accommodate three tank cars. Each is equipped with a set of valves for controlling the unloading rate and an indicating orifice meter for observance of flow rate. Under most conditions, tank-car propane pressure is great enough to induce liquid flow from the tank car directly into the spheres. On occasion, however, particularly in extremely cold weather, the car pressure is insufficient to promote such flow, and it is necessary to pressure the cars with natural gas to force liquid flow.

Vapor remaining in the car after pressure has been reduced to approximately that of the sphere is not removed, since the quantity of propane remaining is too small for such removal to be economical. Using this system of unloading, extremely high flow rates can be obtained. Actually 144 cars of propane were unloaded in approximately 40 days. It appears that unloading rate is limited primarily by the setting of excess flow valves in the tank cars and, of course, by the ability of the refrigeration system to remove heat which is introduced into the spheres while unloading. Some non-condensible gases are introduced into the spheres during unloading and these gases are bled from the top of the spheres as required.

The Hortonspheres, which were designed and erected by the Chicago Bridge & Iron Co.'s Birmingham plant, are 51 ft in diameter with a total water capacity of 520,000 gal. each. They have a working pressure rating of 75 psig. Each of the spheres is insulated with 4-in. thick blocks of foam glass which are imbedded in, and covered with, an asphalt mastic. The entire outer surface of the insulation is covered with a special white mastic providing maximum heat reflectivity. Since most of the sphere connections are made at the top, each of the vessels is equipped with a stairway and a causeway across each moat for easy access.

Fig. 1. General view of plant.

There were a number of reasons for selecting refrigerated storage and spherical vessels. A sphere is, of course, the ideal shape for a pressure vessel and requires less steel than any other type. The spheres employed are of a standard size and require less investment than would have been needed to obtain the same storage in more usual cylindrical pressure vessels of approximately 30,000-gal. capacity. Since the standard sphere was rated at 75 psig, it was felt that it would be desirable to store the propane at temperatures which would produce pressure in the order of 60 psig. At this pressure, the temperature of the propane is approximately 30 to 35 deg F, which is easily obtained using the propane itself as the refrigerant for single-stage refrigeration. Refrigeration compressors, each rated at 25 tons, remove propane vapor from the top of the spheres, compress it to approximately 225 psig, from which point it flows into an air-cooled condenser where the vapor is condensed to liquid. The high pressure liquid is returned to the

top of the sphere where it is injected into the sphere through back pressure regulators, thus completing the refrigeration cycle.

While there are only three storage vessels, the refrigeration system includes four compressor-condenser units, one of which serves as a spare. The spare unit may be valved into the refrigeration piping of any one of the storage vessels and may be electrically connected to that vessel's refrigeration control apparatus so that it is possible to have 50 tons of refrigeration on one sphere if needed.

It appears that the maximum heat gain from the sun load on any one sphere is about 60,000 Btu per hour or the equivalent of five tons of refrigeration. But, the greatest heat gain in any sphere occurs in the process of unloading propane from tank cars. In fact, as was mentioned earlier, one of the limitations on the unloading rate is the ability of the refrigeration system to remove heat from the propane. For this reason, among others, the decision was made to install 25-ton, high-speed refrigeration compressors driven by 40-hp electric motors.

Refrigeration equipment is turned on and off by precise pressure switches which cut-in refrigeration at approximately 60 psig, and cutout when the pressure has been reduced by 3 or 4 psi. As a safeguard, sphere pressures are continuously telemetered to the gas company's system control office where alarms will indicate excessive pressure. The refrigeration system is entirely automatic and has performed very satisfactorily to date.

There were some problems encountered in placing the refrigeration system in service. Not the least of these was the presence of small amounts of water which were carried along in the liquid propane stream and finally froze at the point where pressure was reduced, thus blocking refrigeration return lines. The problem was ultimately solved by the installation of gravity-type, centrifugal water separators which remove water and some heavy oils.

It is necessary, of course, to keep the amount of non-condensible gases in spheres down to some reasonable point where they do not materially interfere with proper operation of refrigeration equipment. This is accomplished by bleeding off non-condensibles to atmosphere when a pressure-temperature curve indicates that they are present in appreciable quantities. The refrigeration equipment for all of the spheres is housed in an open shed (*Fig. 2*).

Considerable study was given to pumping liquid propane since early experience has shown this to be a difficult problem. As a result of this study, three vertical centrifugal pumps, each rated at 105 gpm at 210 psig discharge, were installed to pump liquid propane from storage spheres to the vaporizers. (*See Fig. 3.*) These pumps were chosen because of their ability to handle large quantities of volatile materials at low NPSH conditions and their simplicity of design. Double mechanical seals with oil pressure on the outer seal were installed on each pump in an endeavor to prevent propane leakage.

Prior to operation, the pumps are primed by a pres-

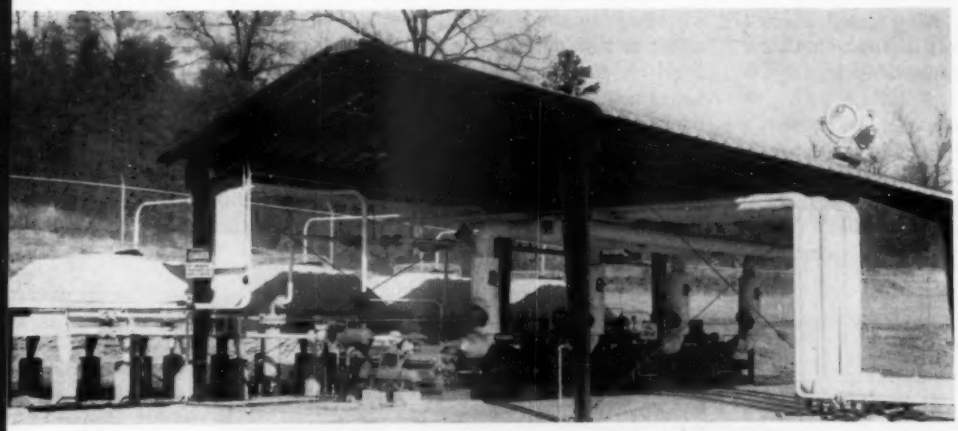


Fig. 2 (above). Refrigeration building, showing refrigeration compressors in foreground, air cooled condensers in background.

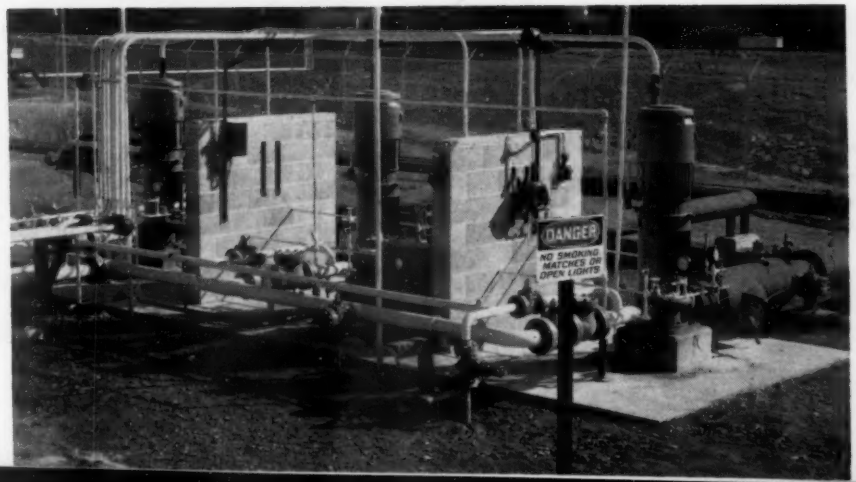


Fig. 3 (right). Multi-stage centrifugal pumps with oil seal pump propane to vaporizers at about 200 psig without leakage.

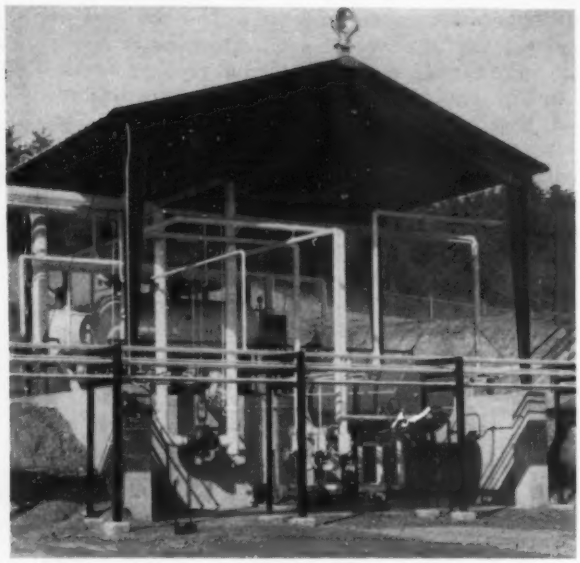


Fig. 4. Vaporizer shed showing vaporizers and condensate return pumps.

sure equalizing line from the pump discharge side back to the spheres. They may also be primed by bleeding off vapor to a permanently installed flare. Discharge pressure of the pumps is regulated by a back-pressure regulating device which spills any liquid not used by the vaporizers back to the spheres.

During the past winter season, these pumps have performed quite well. There is every indication that the decision to employ multi-stage centrifugal pumps for this purpose was a sound one.

That portion of the plant considered to be the production area consists of the propane vaporizer and superheater, the air compressors, boilers, standby power generator, and control house. The vaporizers, superheater, steam condensate tank, boiler feed pumps, and instruments necessary for the operation of these devices are installed in an open shed between the storage area and the main plant buildings. The general layout of the equipment in this building may be seen in *Fig. 4*.

The vaporizers employed are horizontal kettle-type, U-tube units, with rated capacity of 28,000 lb per hr of propane. Liquid propane injection to the vaporizers is regulated by a liquid level controller. Steam injection is controlled by pneumatic pressure controllers actuated by the propane vapor pressure. Two vaporizer units are employed—both for operating flexibility and to allow room for plant expansion. Since the propane vapor leaving the vaporizers is at or near equilibrium, it is then introduced into a superheater where the temperature is elevated by approximately 35 deg F. Steam injection to the superheater is automatically regulated by a pneumatic temperature controller actuated by the temperature of the vapor leaving the superheater.

The steam condensate from the vaporizers and the superheater is returned to an insulated tank located below these units. The water from the tank is returned to the boilers as needed to maintain proper water level in the boilers themselves. Makeup water is introduced automatically to maintain a constant water level in the condensate tank.

The boilers, which supply steam for the vaporizer and superheater, are installed in a full enclosed metal prefabricated building. Two 350-hp, 100 psig, automatic package boilers not only provide for the present needs of the plant, but will also handle possible future expansions. The boilers are equipped with both gas and oil burners. But they normally burn No. 2 fuel oil since at the time the plant is operating, every effort is being made to curtail the use of natural gas. Fuel oil for the boilers is stored in two 15,000-gal. tanks near the boiler house. The building is equipped with gas-fired unit heaters to eliminate the necessity of draining the boilers during those periods, when the temperature drops below the freezing point of water. Since very little makeup water is required in this system, shot-type boiler feed water treatment is employed.

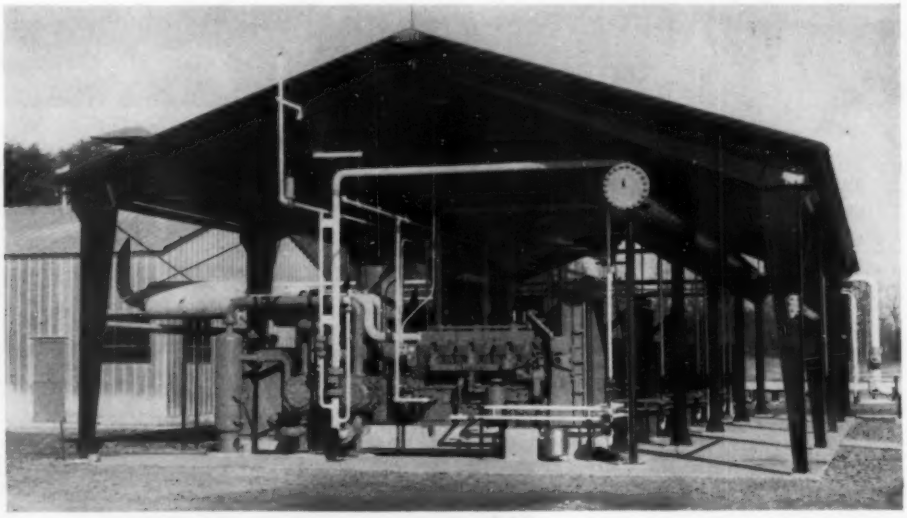


Fig. 5. Compressor building houses four gas engine compressor assemblies, one of which can be seen in foreground.

The quantity of compressed air required for the operation of the plant is about equal to the amount of propane vapor produced. The air is provided by four horizontal, opposed, double acting air compressor units installed in an open shed adjacent to the control building. This air compressor equipment is shown in *Fig. 5*. Each compressor is rated at 1580 cfm at 180 psig, discharge pressure. The prime mover for each of the units consists of a 500-hp gas engine equipped with facilities to use either natural gas or propane vapor for fuel. The cooling systems for the engines and for the compressors are separate, but each consists of a radiator, fan, and water pump in individual closed systems. The engines are provided with air starter motors, which get compressed air from a small reciprocating air compressor and two 20-cu ft air receivers. The piping is so arranged that compressed air from the first engine to be started may be used to start the rest of the machines. In an extreme emergency, natural gas pressure may be used to actuate the starting motors.

The use of four air compressor units makes it possible to vary the plant output in increments of 25 per cent of total plant capacity and also provide a degree of dependability that could not be obtained if only one or two units were employed. The initial cost of the four units is considerably less than would have been required for the purchase of one or two larger units to provide the same total capacity.

In selecting the engines and compressors, intermittent duty ratings were used, since the plant is designed to operate only a few days each year. This resulted in a considerable saving in capital outlay.

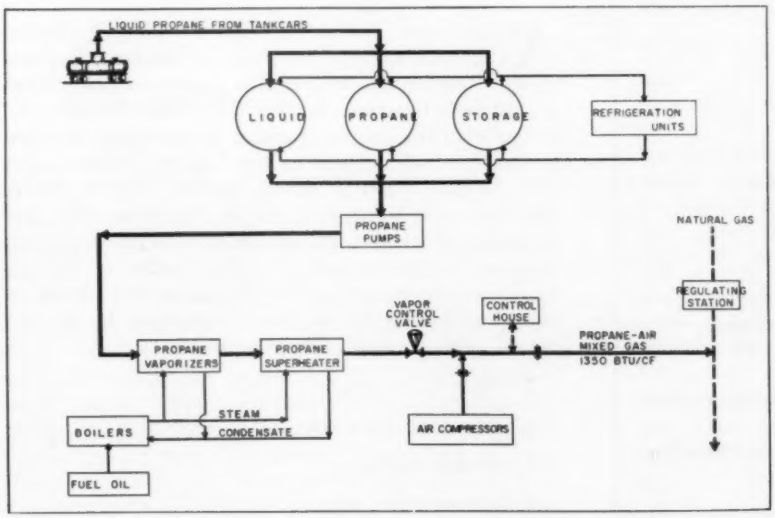
In operation, the compressed air is mixed with propane vapor and introduced, through suitable metering and control devices, into the gas distribution system. The gas produced by the plant normally has a heating value of 1350 Btu per cu ft, but gas of any other heating value may be produced quite easily.

The air-vapor ratio and, therefore, the heating value of the final product, is regulated by the adjustment of a motor valve in the propane vapor line which is manually operated from the control building. The control panel is equipped with an air flow meter, a production gas flow meter and a fast acting caloroptic device in addition, of course, to pressure gauges and other instruments necessary for proper operation of the plant. The operator is thus able to make his adjustment of the vapor air ratio on the basis of information furnished him by these instruments. The production gas is finally monitored for heating value by a Cutler-Hammer calorimeter, which furnishes a precise recording of the heating value at all times. The fast acting caloroptic device previously mentioned is adjusted periodically to agree with this precision calorimeter. This method of operation has proved to be both simple and quite satisfactory. Heating values within plus or minus 5 Btu per cu ft of the desired value have been easily maintained.

Start up of the air compressors is considerably simplified by the use of a back pressure regulating valve which discharges to atmosphere. Since this valve is set to hold the air pressure slightly higher than the plant delivery pressure, the transition from "spill" to "make" is smooth and easily controlled. This simplifies the task of adjusting heating value when the plant production quantity is changed.

It was mentioned earlier that pneumatic type instruments are employed in the various phases of the plant which are automatically controlled. All of these instruments use clean, dry, natural gas as their operating medium since it is readily available and is extremely satisfactory for this application.

During the winter of 1958-59 both of these plants were operated for a considerable period of time. The operating experience, to date, shows that the fundamental design of the plants is sound. Since the plants are basically quite simple, training of operating personnel has posed no particular problem. The refrigeration equipment has performed very much as expected, and has required a minimum amount of maintenance. It appears, therefore, that the combination of propane storage at moderate temperatures and a manually operated production plant has provided a very satisfactory source of peak shaving gas for the Alabama Gas Corp. ■



Simplified flow diagram of Birmingham propane-air plant.

PEAK-SHAVING ISSUE

Stand-by plant inspection

SOME DISCREPANCIES NOTED IN ONE INSPECTION REPORT

1. No test certificates on file for the storage tanks.
2. Inspector was unable to slug off excess flow check valve on top liquid outlet connection of the tank.
3. Bottom liquid outlet connection has a leaking valve which is plugged and appears to be in a hazardous condition.
4. Face of tank pressure gauge needs replacement due to rust on gauge dial which makes it difficult to read.
5. It appears that water has condensed inside dial of liquid level gauge. This should be removed and dried out to prevent possible rust damage to gauge itself.
6. Ground connection for storage tank needs some attention.
7. Roney relief valve on storage tank should be returned to factory for retesting and recertification.
8. A check valve should be installed on 1-in. vapor line between vapor compressor and point where it ties into piping at storage tank.
9. On liquid pump, it is recommended that bottom tank outlet be used for liquid supply to pump inlet, and that piping be kept at a low level as it runs over to pump.
10. Pump bypass valve line returns to vapor return piping at storage tank. This is not a satisfactory arrangement in that it allows liquid propane to enter vapor piping. Propane vapor and liquid pipe should be kept separate from another.
11. Smaller vaporizer appears to be inoperative and should be overhauled.
12. Gas-mixing equipment is not in operating condition.

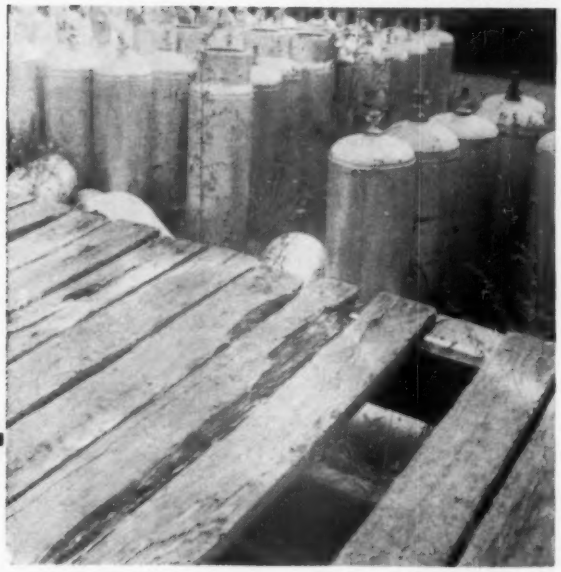
GAS staff report

By WILLIAM T. HARPER, Eastern Editor

AT the American Gas Association's 1959 Production Conference, C. L. Pendleton of the New England Power Service Co., delivered a paper entitled: "Suggested Safe Practices for Stand-by Plant Operations." Along with the proper training of personnel, he cited preventive maintenance as the biggest problem area in upholding stand-by safety factors. Don H. Townsend, vice president of Drake & Townsend, Inc., and in charge of that company's propane plant inspection service, could not agree more with Pendleton. In fact, he lists nine areas in a stand-by plant that should be subjected to regular periodic inspection by an unbiased outside expert. Those areas are:

1. Basic plant design.
2. Unloading stations.
3. Storage tanks.
4. Safety relief valves.

WATCH OUT FOR THIS



CYLINDER CHARGING
PLATFORM AND STORAGE AREA

Note poor condition of platform. This plant is in daily use despite hazardous conditions. Also note cylinders stored in horizontal position. These are empty cylinders. A platform and rack should be provided for safe storage of empties. Grass and weeds among cylinders represent a definite fire hazard.

. . . AND THIS

UTILITY LPG PLANT

Transport truck unloading station adjacent to storage tank. Preferred location is 50 ft away. NOTE: Poor practice of leaving hose on ground; lack of proper protection for aboveground piping from vehicles and resulting damage left unrepaired; grass and weeds beneath storage tank and piping; lack of flexibility in bottom tank outlet piping.

5. Line valves and regulator stations.
6. Vaporizers.
7. Gas-air mixing equipment.
8. Air compressors and boilers.
9. General safety.

In a recent inspection of a stand-by plant, at least an even dozen discrepancies were found (see box); discrepancies that would probably have prevented use of the plant when it was needed most. There are times when shortcomings such as these are the result of the continuing changes being made in the standards and regulations. Other times, simple neglect may be the cause. Take for instance, a propane stand-by plant that was installed by a New England gas company 10 years ago. The company never had an occasion to use the plant. Yet, a routine Draketown inspection revealed that the utility could not have used the system in its present condition even if it wanted to, due to the deterioration of the equipment over the years.

This very thought was mentioned prominently by Pendleton in his paper. "Deterioration or mal-function of equipment," he noted, is the major cause of stand-by plant breakdown. Townsend carries this idea a step further by stating that he has found valves to be the major source of such deterioration or mal-function.

"A problem which is common to all propane plants, whether they be industrial or utility, is in the safety relief valves in the storage tanks," he says. Until a comparatively few years ago, the majority of these valves installed were the springloaded type. They had a long stem and travel spring and were made of bronze. After they popped-off to relieve the pressure, there were times when they would not re-seat themselves because the long stem got caught. This then

allowed the gas to keep bleeding off. Usually, any valve installed before 1952 was also of the type that had an unsafe drain hole arangement.

A couple of years ago, American Car & Foundry Industries, Inc., redesigned this type of valve. It is now being made entirely out of steel. Some are even being made of stainless steel while still others are being cadmium plated. These, of course, are much stronger than the bronze type. These new valves have short stems and travel springs, thereby eliminating the tendency to get stuck.

"Over half the relief valves installed in the country are those older type and we recommend that they be replaced," Townsend states. This can be an expensive proposition as these valves cost about $125 each. But, this expense can be justified by considering what good the old set up would do if it would not work when it was needed most. An alternative would be to test these valves at least every five years in compliance with the National Board of Fire Underwriters Pamphlet #59. They should be sent back to the manufacturer for testing. But, unless a three- or four-port manifold, such as is made by Roney, Inc., or Bastian-Blessing's RegO, is used, the sending back of the valves to the manufacturer for testing would necessitate the draining of the storage tank.

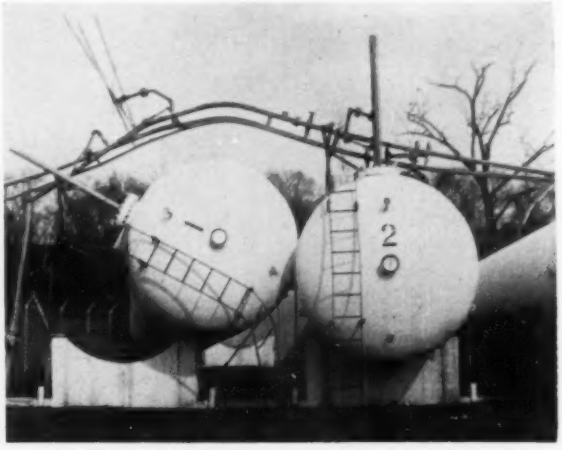
Plants put in by a utility before it switched to natural gas have a peculiar problem all their own. Townsend recalls the troubles faced by one company that did this while they were still supplying manufactured gas. The peak-shaving plant consisted of four 30,000-gal. propane tanks, vaporizing equipment and some jet compressors to make low pressure propane-air. Upon inspection of this plant, a lot of little leaks were found. These were coming from the plug cocks that had been used in the original installation instead of globe valves. The plug cocks served their purpose when the manufactured gas provided the lubrication necessary to seal them. After the change-over to natural gas, the plug cocks became dried out and prone to leaks. Townsend suggested that these, too, be replaced.

Throughout a utility plant, Townsend's inspection service has found minor leaks to be a major fault. Many times these little leaks go unnoticed. One of the reasons for this is that both natural gas and propane use basically the same type of odorant. And utility company workers, being used to the former, often overlook the latter. Valve packing, unloading stations, and tank cars are places that are particularly vulnerable to these small leaks.

Just plain lack of general maintenance is another problem. Keeping the equipment properly painted helps increase its efficiency by reducing the possibilities of rust buildup. Draketown recommends a white paint or any pastel color paint rather than aluminum, which it feels grays considerably after the first year and loses its reflective qualities. In this same vein, it is suggested that, if possible, protective covering on storage tanks be avoided if they are not going to be cared for. Townsend recalls a utility that covered its tanks with a mineral wool covering and topped that with some sort of mastic tape. Later the covering started to peel away and rain water, snow, etc., got down between the covering and the tank and resulted in extensive rusting.

A good maintenance program, using a comprehensive check list, would have discovered this problem before it became a serious one. Public Service of New Jersey uses such a program and check list. It has found that this helps to eliminate the chances of an inspector missing important parts of the plant, such as might occur in a hit-or-miss type inspection. These schedules should be set up regularly, depending upon the size and complexity of the plant. Most of the larger utilities do have such programs but Draketown has found the middle-sized and smaller companies lacking in this respect.

Unloading stations present even larger sized problems. Here have been found hoses that have been in use from nine to 12 years and never been tested. A hydrostatic test at 500 lb is recommended at intervals of about four years. A good many times, these hoses have been left lying on ground, exposed to the weather. They then become a source of contamination of the product. Hoses also become an entrance for dust. Liquid strainers, absent in many cases, would solve this problem. Dust plugs and caps would help.



Flood damaged storage tank, caused by flotation of nearly empty tank. Other tanks were 50 per cent or more full of propane and did not float. Better distribution of propane among tanks would have prevented most damage shown. Excess flow and back pressure check valves prevented loss of propane in these tanks. Flexibility of piping allowed a minimum of damage to unfloated tanks, reflecting advantages of good basic piping design.

"IN DIRECT VIOLATION OF NBFU PAMPHLET 59"

SAFETY RELIEF VALVES

Note these two valves installed with a plug cock between them and the tank. This is in direct violation of NBFU Pamphlet 59, Paragraph 516. Note that no weep lines have been installed to carry away moisture which collects in the vent stack above the relief valve. Discoloration of tank and added corrosion hazard result.

too, as would the proper storage of the hoses when they are not in use.

"Unloading stations," Townsend reports, "are the lifeline of any plant. Yet, in a good many cases, these stations are more neglected than any other part of the plants." The condition of couplings, sight flow indicators, valves, pipes and fittings should be given particular attention. The existence and working order of proper bleed valves for safe disconnection of the hoses should be checked along with the location of strainers, check valves and hydrostatic relief valves.

It has even been noted that some unloading stations are not properly located. In most localities, they must be at least 50 ft from the main line of the railroad. Some have been found directly adjacent to the main line and diesel railroad engines—with sparks flying—are passing nearby.

An even more outstanding example of carelessness is the failure to post "Tank Car Disconnected" signs. The use of such signs is mandatory under National Board of Fire Underwriters standards. In some cases, even those signs that have been posted have been so beaten up in past usage that they are unreadable and, therefore, worthless.

Sometimes, even leakage in tank cars has gone uncorrected or unnoticed. Personnel unloading a tank car should be cautioned continually that if they find leaks or anything wrong with the car, they should report it immediately on the forms provided. This is the best way of informing the tank car owner that something is wrong with his equipment.

Still another factor to be considered in the design of unloading stations is the existence of check valves on the unloading lines. The direction of flow should be from the unloading station to the tank farm. The purpose of this, of course, is that if the hose breaks the propane could not come back from the farm and spill out. In some inspections, it has been found that even the flappers have been removed from the check valves.

General plant design should not be overlooked. Errors have been found in minimum distances between pieces of equipment, buildings, storage tanks and adjacent property lines. Sometimes these do not meet the recent changes in the standards. It is not suggested that the utility move its entire plant because it is too close to an adjacent property line. But, sometimes it might be worthwhile for the company to buy, if possible, an extra 10 ft or so along the present line to protect itself.

In basic plant design there are occasions where piping should be relocated due to the fact that it may be in a place where an employee can bump his head or the piping might be hit by vehicular traffic. Following the original installation, subsequent findings may show that some piping would be better off underground than above ground and visa versa. This fact should be considered.

Line valves and regulator stations are many times overlooked in a routine inspection. All valves, fittings, vapor and liquid pipelines and regulators should be checked for physical condition, leaks, types of closures, and operating efficiency. Dual regulators are recommended for if something goes wrong with one, the second can be utilized quickly. Pressure settings on the regulators should be checked.

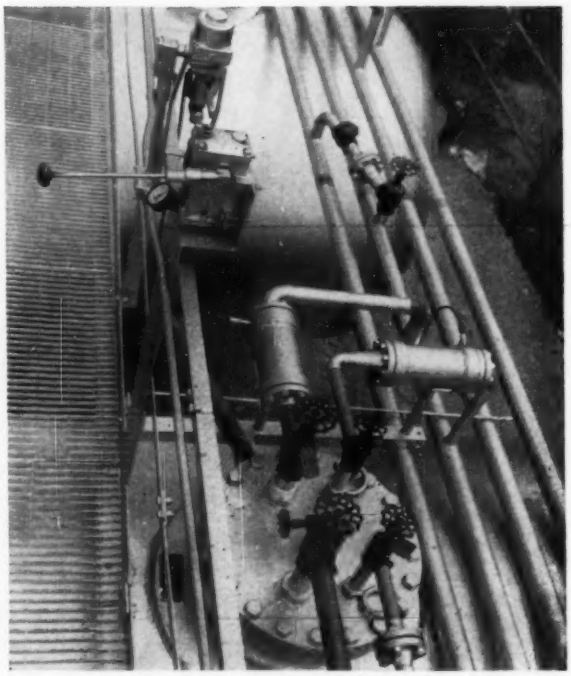
The same is true with vaporizing equipment. Townsend has found that this is pretty generally neglected despite the fact that it is the heart of many plants. He recommends that a vaporizer be taken apart and pressure tested and visually inspected at five-year intervals. And no vaporizer is any better than its steam trap and strainer. Operating the equipment monthly would provide a check for these.

Close attention should be given to the gas-air mixing equipment. Such items as thermeters, calorimeters, gravitometers, etc., should be serviced regularly by the manufacturer on a six-month or yearly basis. Most manufacturers, such as Cutler-Hammer, make this service available right on the utility property. This equipment installed in stand-by plants should be operated either into the gas distribution system or to a flare at regular intervals.

Regarding the air compressors and boilers, it is again suggested that the manufacturers inspect and service these. Boiler feed water treatment is many times overlooked and can affect plant capacities and unit life.

Last, and certainly far from least, is the matter of plant safety. The first thing and foremost thing to be considered here is compliance with all existing rules and regulations regarding fire prevention. Adequate safety signs, fencing around storage tanks and specialized buildings to restrict unauthorized personnel are a must. Gates, roadways, lighting and electrical conduits and connectors must all comply with the latest regulations.

Another important item is, of course, fire extinguishing equipment. Every propane plant should have (1) an ample water supply that can be used for cooling tanks in case of fire and (2) dry chemical extinguishers. As a rule of thumb, Draketown recommends that each 30,000-gal. storage tank should have available 700 gal. of water per minute. Water spray systems, though expensive, are considered the best. Chemical fire extinguishers should be located both inside and outside of the buildings. It has been noted



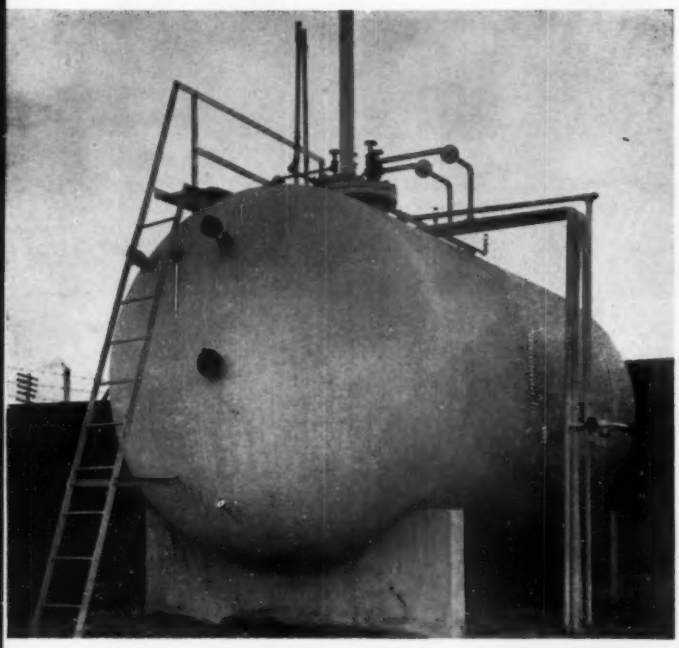
View of remote-operated hydraulic shut-off valves on liquid-in and liquid-out lines at tank. At top center is an explosion-proof solenoid valve. It operates remotely to bleed oil pressure from hydraulic valves and close them. Just below solenoid valve is hand-operated oil pump and oil reservoir to supply oil pressure which opens hydraulic valves. Fusible plugs are on oil lines to valves. These plugs melt in event of fire and relieve oil pressure at valves, closing them.

that in some cases, there were none on the outside. Thus, if a fire or explosion should occur, those inside the buildings may not be easily accessible. Of course, these fire extinguishers should be checked regularly, at least every six months, by the manufacturer.

The National Fire Protection Association and the NBFU are constantly upgrading their standards. These changes are not retroactive. But, where it does not involve a large capital expenditure or high cost, it is recommended that these changes be complied with. An example of such a change would be in the relief settings of hydrostatic valves on the liquid lines. They used to be set at 250 psig. About two years ago, NBFU changed its ruling to read 350 psig. There are thousands of these valves in operation today that have not been re-set at the higher rating. This simple and non-expensive change could and should be made.

As can be seen, an inspection program is a vital need. Yet, according to Pendleton, only seven of the 17 companies he checked with had such a program. That's

These installations pass inspection



Note three upright water spray nozzles along top of 7500-gal. propane tank. Cork expansion pad between tank and concrete saddle of foundation allows for expansion and contraction and protects part of tank in contact with foundation from corrosion. Pressure gauge on top head of tank is at the 85 per cent liquid level. Allows for a second means of gauging tank contents to prevent over-filling. Also note Rotogauge at center head of tank and thermometer at bottom head. This small tank requires only a single relief valve. Two small vent stacks from hydrostatic relief valves are on liquid lines.

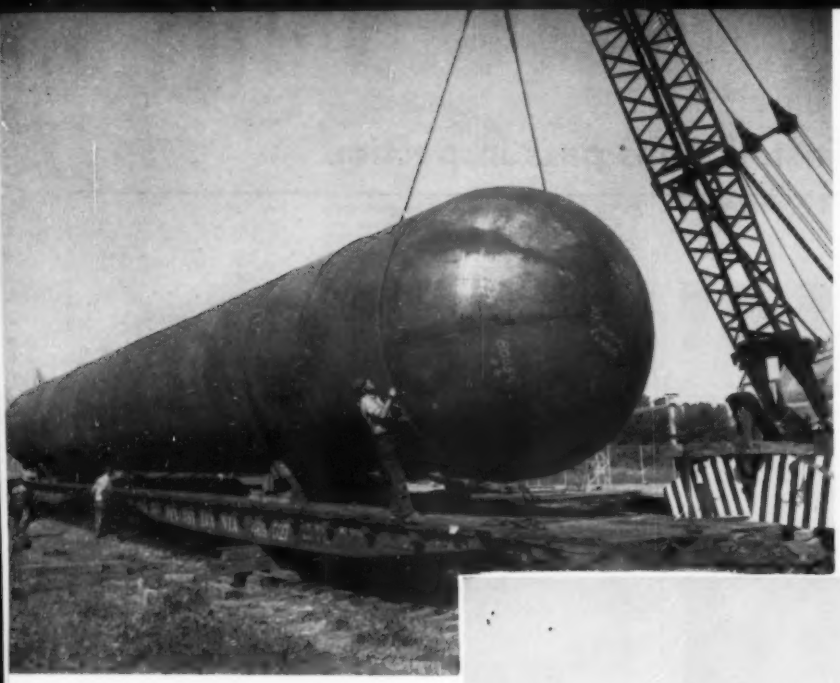
Typical tank car unloading facility. Includes LPG unloading compressor (in metal dog house), unloading tower with cantilever platform. Station is totally enclosed by fence and well lighted, explosion proof. LPG hose and tank car pipe connectors are safely stored inside metal dog house when not in use. Unloading tower and piping are grounded and portable ground connectors are provided to ground tank car to both rail and unloading tower.

less than 50 per cent. And even in these, there were occasions where the personnel were not properly trained. Only two companies used any kind of an aptitude test in selecting their stand-by plant employees. The men were being drawn from all sections of the companies.

Some companies have neither the time, money, personnel nor training facilities to conduct such an inspection program of their own. In such cases, an outside agency, such as the Draketown Propane Plant Inspection Service, would be the answer to this pressing problem. Even large companies would find it worthwhile to bring in an unbiased outside inspection agency to go over their stand-by plant facilities. Too often it has been found that company inspectors have been extra lenient with their co-workers and not reported all the violations noted.

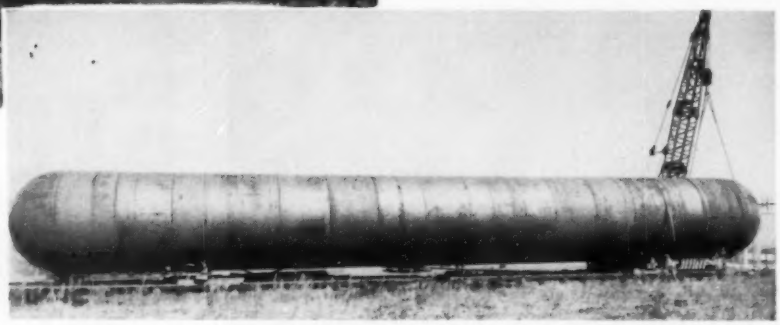
With an unjaundiced eye, Draketown inspectors have the company employees actually operate the equipment and are then able to make suggestions as to how it might be done better. They feel that an annual inspection is desirable. Naturally, the problems turned up in the first year would be, numerically speaking, the largest. But, once these major problems are eliminated, succeeding inspections would take considerably less time.

Some of these inspections can be costly—up to $10,000 in one case. Others are not. It cost one company only $5 (repair of clogged strainers) to bring its rating up to "excellent." Regardless of the cost, where safety is involved, it is an absolute necessity. Then, too, what good is a stand-by system—costing thousands of dollars to install—if it will not work when it is needed most? Such was almost the unhappy experience of a company in Colorado after it spend $75,000 for the installation of a propane stand-by plant three years ago. A routine Draketown Inspection revealed that someone had neglected one important item. No propane was *ever* put in the tanks! ■



PEAK-SHAVING

Left: Sling lifts one end of tank to shift it over to the right, onto cribbing. Below: Tank sits on bolsters on two flatcars, as shipped. Bolsters provided the pivot points as cars moved around curves.



How Northern States Power saved more than $50,000 by

Installing 90,000-gallon propane tanks

IN 1958 a new horizon was opened for LPG unrefrigerated tank storage. Revisions in the NFPA and NBFU codes raised capacity limits of containers for storing liquefied petroleum gas at utility gas plants. The ceiling went from 30,000 to 200,000 standard U. S. gallons.

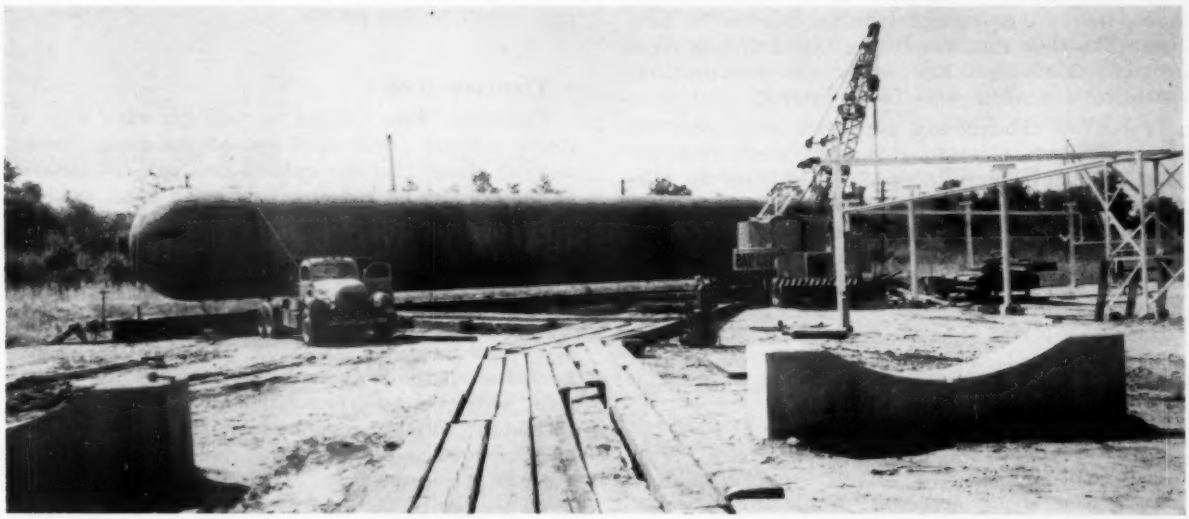
Northern States Power Co. had a project in its 1959 construction program for increasing the storage capacity of its Maplewood gas plant in St. Paul. A 300,000-gal. addition was planned by installing 12 30,000-gal. tanks.

The "new look" in tank capacity appeared attractive. As a result, a feasibility study was made on the subject. Tanks of 45,000, 60,000, 72,000, 90,000 and larger capacity would be available from the leading tank manufacturers that would meet the codes for unfired pressure vessels as well as company specifications for complete oven stress relieving of the completed tank at the factory. With that background and price quotations on various tank sizes, it was possible to make installed capacity cost comparisons.

As expected, the major cost advantage was found

By J. C. SIMANDL, Assistant General Superintendent of Construction and WALTER PETERS, Gas Design Engineer
Northern States Power Co., St. Paul, Minn.

Left: Two tanks on foundation blocking prior to coating tank surface to rest in concrete cradle. Third tank in background is still on flatcars.



Skidways in place for rolling tanks. Winch truck is pulling one end of tank over on Y connection of skidway.

Right: Tanks on blocks on foundation. Bright areas on tanks show the tank protective coatings where tanks will rest in saddles.

to be in the reduction in number of individual tank accessories, valves, gauges, platforms and ladders, tank piping and foundations. The only exception in this category was the relief valves which require a capacity based on surface area as specified in Appendix A, NBFU. Additional, but lesser savings, were estimated in costs of yard fill, grading and surfacing, fencing, lighting, fire protection, water mains, header piping and valves, and painting of tanks. Cost of tank capacity per gallon did not show any great saving through the adoption of larger tanks but there was an advantage. The most favorable price per gallon unit appeared to be in 60,000-gal. tanks. One of the larger tank sizes actually came to a higher unit cost.

The total saving by substituting four 90,000-gal. tanks for twelve 30,000-gal. tanks was conservatively estimated in excess of $50,000. Interim job estimates now indicate that the completed cost saving will be considerably in excess of the estimated saving.

In the feasibility calculations on large capacity tanks, the savings zoomed with an increase in tank sizes. The slide rule would have kept grinding right up to the 200,000-gal. limit except for some practical considerations which may be of interest.

It was first thought that giant size tanks could not be completely fabricated and shipped by rail from the point of manufacturer. Since St. Paul is on the Mississippi river, barge shipment was investigated. It was found that loading huge tanks, rail to barge, and finally barge to rail would not be economical. Inquiry disclosed that tanks up to 110,000 gal. with certain dimensions, could be shipped by rail. The controlling factor was reported to be the degree of railway curves along the line of shipment and that a routing was necessary within the limits of curves that the tank could traverse.

• Other factors

Equipment layout and space availability was another factor to consider. A 110,000-gal. tank has a length of about 130 ft. The tanks were to be for aboveground installation. This calls for 100-ft normal clearance from any building line or major buildings of the gas plant.

Capacities in multiples of 30,000 gal. were also considered since all tanks previously installed were of the 30,000-gal. size.

Layouts and cost comparisons showed that 90,000-gal. tanks were the best solution for the particular case. The installation was designed on that basis to tie in with the present three pipe header system; liquid in, liquid out, and vapor lines.

For fire protection, it might be mentioned that for two rows of two tanks each, water fog hose stations are being placed in front, in the middle and at the end of the rear tanks as well as two stations located between the 90,000- and present 30,000-gal. tanks. Each station is equipped with 100 ft of 1½-in. hose and a 1½-in. fog nozzle and 100 ft of 2½-in. hose and a 2½-in. fog nozzle.

Water supply is from the present 500-gpm deep well pump water system.

The 90,000-gal. tanks were fabricated without any particular difficulty. Specifications called for 100 per cent radiography of all seams and the complete oven stress relieving previously mentioned. Since all tank clips, openings, grounding connections, etc., had to be completed before stress relieving, the tanks were ready for setting on the foundations when they arrived.

Another item involved with increase tank sizes was that of type and capacity of relief valves. Obviously, any work on maintenance or replacement of conventional relief valves would be quite a job. Therefore, two manifold type reliefs with four valves each were selected for these tanks. They permit replacement of any valve without taking the tank out of service.

Up to the time of delivery, the tanks were described as "large capacity" or "giant economy size" but when the tanks were first viewed on the flat cars, the word "monsters" came into use. The tanks are 105 ft long and 12 ft-6 in. in diameter. They weigh 93 tons each and when filled will have a gross weight of slightly over a half million pounds.

• Transportation

The tanks were shipped on two flat cars with a cradle support under each end of the tank. These were so placed that the ends of the tank and middle of the tank would swivel out or in an equal amount when the cars negotiated railroad curves. Tanks were in transit for a period of 10 days from point of manufacture, the J. B. Beaird Co. in Shreveport, to St. Paul.

The siding for receiving propane tank cars at the plant was used for unloading the tanks. This is located about 300 ft from the farthest position in the plant where the tank foundations had been prepared. The latter consist of concrete foundations placed 84 ft apart and set on piling some of which was driven to a depth of over 80 ft.

Moving of the tanks was done on skidways constructed of 12-in. x 12-in. timbers which were decked with hardwood planks. Tanks were rolled on steel rollers to a point adjacent and parallel to the foundations. A 40-ton mobile crane was used to lift and shift the tanks, one end at a time.

A winch truck was used to roll the tanks as required.

The unloading and placing operation for the four tanks took 20 days and 765 man hours of time.

Connecting and piping up the tanks proved to be the big pay off. A five-man crew did this work in just 15 days.

With these tanks in service, additional advantages are anticipated. There are fewer valves to operate when filling or drawing from tanks, fewer gauges to read, less equipment to maintain and less tank surface and piping to keep painted.

Seventy-five thousand gallons of propane in one tank may appear to be a lot of eggs in one basket. But with the type and quality of manufacture available today and the use of safety devices that can protect such an installation, the net result could well be superior to three 25,000-gal. baskets of propane. ■

Gas industry set all-time records in '59

By WISTER H. LIGON, President
American Gas Association

WITH annual sales revenues exceeding $5 billion for the first time, the gas utility and pipeline industry moves full-speed into the Sixties, confident that gas will continue to strengthen and expand its position as a major energy supplier for a growing nation.

As 1960 opens, the industry's 1350 distribution companies and 100 transmission companies serve a record-breaking 32.6 million customers. Annual sales of gas have reached a new peak of more than 87 billion therms.

A record year climaxed the greatest decade of expansion in the 143-year history of the gas business. Sales, revenues and gross plant have more than doubled since 1949. Customers have increased by 39 per cent in this period, and the number served with natural gas has doubled. While gas use has climbed to an all-time high, proved reserves also have advanced to a new peak, assuring adequate long-range supplies.

Record construction outlays of $1.8 billion during 1959 for new facilities to serve more customers reflected the confidence of an industry which expects to more than double in the Sixties. In the four-year period 1959-62, nearly $8 billion will be spent for construction and expansion projects, compared with $6.3 billion in 1955-58.

The development of transoceanic natural gas shipment by tanker ranks among the industry's greatest achievements in recent years.

CUSTOMERS

(at Dec. 31)	1959	1958	Per Cent Change
Residential	30,000,600	29,259,000	+ 2.5
Commercial	2,399,500	2,361,000	+ 1.6
Industrial	138,000	135,000	+ 2.2
Other	37,000	37,000	—
Total	32,575,100	31,792,000	+ 2.5
(Average)			
Residential	29,567,800	28,786,500	+ 2.7
Commercial	2,330,300	2,286,600	+ 1.9
Industrial	136,500	134,200	+ 1.7
Other	36,500	34,800	—
Total	32,071,100	31,242,100	+ 2.6

SALES

	1959	1958	Per Cent Change
(Thousands of Therms)			
Residential	30,228,200	28,124,500	+ 7.5
Commercial	8,143,400	7,648,900	+ 6.5
Industrial	44,912,500	40,764,000	+10.2
Other	4,117,400	3,747,600	—
Total	87,401,500	80,285,000	+ 8.9

REVENUES

	1959	1958	Per Cent Change
Residential	$2,935,702,000	$2,657,616,000	+10.5
Commercial	616,186,000	571,212,000	+ 7.9
Industrial	1,407,054,000	1,228,980,000	+14.5
Other	126,482,000	110,513,000	—
Total	$5,085,424,000	$4,568,321,000	+11.3

Preliminary 1959 compared with 1958.

• Customer increase in 1959

The gas industry served an average of 32.1 million customers during the year, representing a 2.6 per cent increase over the 1958 average of 31.2 million. The year-end total is 32.6 million.

Utility customers receiving natural gas averaged 29.1 million to register a 3.9 per cent gain over the 28 million served in the previous year. At year's end, natural gas was being delivered to 91 per cent of the industry's customers. Manufactured and mixed gas customers averaged 2.8 million, showing an 8 per cent year-to-year decrease as former users of these fuels continued to convert to natural gas.

The number of gas utility customers is expected to increase steadily throughout the Sixties, climbing to an estimated 43.3 million by 1969, including nearly 40 million residential users.

Gas continued to improve its position as the major heating fuel for homes in 1959. The industry's house-heating customers now total about 20.4 million, up 6.8 per cent from 1958. The number is expected to exceed 21 million in 1960 and 33 million in 1969. Heating customers currently represent 66.1 per cent of all residential gas users, compared with 63.4 per cent in 1958.

• Sales and revenues

Revenues from utility and pipeline gas sales passed the $5 billion mark during 1959, advancing 11.3 per cent above a year ago. Sales produced revenues of $5085 million, compared with the previous record of $4568 million in 1958.

Natural gas revenues increased 12.6 per cent to $4751 million, compared with the 1958 total of $4220 million. Manufactured and mixed gas revenues totaled $319 million, down 4.2 per cent from 1958's $333 million.

The volume of gas sold climbed to a new annual high of 87.4 billion therms, nearly 9 per cent above the 80.3 billion therms sold a year earlier. Natural gas sales rose to an all-time peak of 85 billion therms, up 9.2 per cent from 77.8 billion therms in 1958. Manufactured and mixed gas sales of nearly 2.4 billion therms were off 1.4 per cent on a year-to-year basis.

• Industrial gas sales

Many of the year's greatest gains were recorded in industrial sales, despite the nationwide steel strike. The number of industrial customers served by the gas industry advanced nearly 2 per cent in 1959, and sales jumped more than 10 per cent. Sales yielded revenues of $1.4 billion, or 14.5 per cent more than the $1.2 billion produced by 1958's industrial sales.

While statistics on the relative proportion of firm and interruptible industrial gas sales are unavailable, A.G.A. estimates indicate that only about one-third of all industrial gas is sold on an interruptible basis under which deliveries may be curtailed during periods of high residential heating demand. The remainder is sold under firm contracts.

• Underground storage and pipelines

The growing popularity of gas for residential heating has given tremendous impetus to the development of underground natural gas storage facilities. The gas industry had 205 underground storage pools operating in 19 states at the beginning of 1959, compared with 125 in 15 states a decade ago.

Storage facilities with an ultimate capacity of 2.7 trillion cu ft are located primarily in the Middle Atlantic and East North Central regions. The amount of gas actually in storage reached a new high of nearly 1.8 trillion cu ft, with a maximum daily output of 9.8 billion cu ft.

The industry's capital investment in underground storage advanced to $685 million in 1959, up from $570 million in 1958. We anticipate spending an additional $118 million for such facilities during 1960, and total outlays during the Sixties are expected to exceed $1.8 billion.

Natural gas pipelines and distribution mains continue to extend into new areas and to increase deliveries into residential and industrial areas already served. More than 24,000 miles of pipe was added to the nation's gas network in 1959, bringing the total to 595,600 miles at year-end.

The industry has increased its pipelines and utility mains by more than 231,000 miles since 1949. An additional 283,000 miles will be built during the Sixties, bringing the total to 878,000 by the end of 1969.

Construction in 1960 alone will add 24,500 miles, a near-record figure exceeded only by the 28,500 miles built in 1956 and the 26,200 miles built in 1955. Expansion programs will cost an estimated $1.9 billion this year, compared with $1.8 billion in 1959 and $1.2 billion in 1950.

• Industry gross plant

The gross plant of the gas industry at year's end was approximately $19.7 billion, up 8.8 per cent from $18.1 billion in 1958. Gross plant is expected to reach $21.5 billion in 1960 and will more than double during the next 10 years, advancing to at least $45 billion in 1969. Gross plant has nearly tripled since the beginning of 1950 when the industry total stood at approximately $7 billion.

• Natural gas reserves

The nation's proved recoverable reserves of natural gas reached an all-time high of 254.1 trillion cu ft at the start of 1959. While net production amounted to nearly 11.5 trillion cu ft in 1958 (the last year for which official statistics are available), reserves showed a net gain of 7.6 trillion cu ft for the same period.

• Gas Appliances and Equipment

The industry's 1959 gains in customers and sales were accompanied by a brightening of the gas appliance sales picture as manufacturers made a strong recovery from the 1957-58 recession.

The Gas Appliance Manufacturers Association reports sales were generally above 1958 levels, despite the steel strike's impact upon fourth-quarter operations of appliance manufacturers. Unit sales totaled nearly 8.8 million, compared with approximately 7.8 million in 1958.

Appliance manufacturers now expect sales of most of their products to be as good or better in 1960, with the largest increases forecast for ranges and central heating equipment. Water heater sales are expected to approximate 1959's record high.

The number of gas refrigerator manufacturers increased to three in 1959, and a fourth company will market gas models this year.

Important new developments in appliances and components reflect the industry's increased emphasis on the design and production of modern, competitive gas equipment.

New low-temperature controls incorporated in 1959 models of domestic ranges maintain oven temperatures as low as 140 deg, permitting homemakers to prepare meals well in advance and hold them at proper serving temperatures for hours.

A new 30-gal. automatic water heater enables the homeowner to vary the unit's recovery rate to suit changing hot water requirements in the home. Adjustable burners with gas input settings ranging from 36,000 to 60,000 Btu per hour provide hot water recovery rates comparable to 40- and 50-gal. models.

Direct-spark ignition for clothes dryers, also incorporated in 1959 models, eliminates the need for a constant-burning pilot or electric glow-coil ignition system.

Schwank infra-red burners are featured in a new vertical broiler for domestic ranges approved by A.G.A. in 1959. Both sides of steaks and other meats may be broiled simultaneously between the radiant

burners, resulting in greater convenience and reduced broiling time.

In the commercial field, a new high-speed oven uses the forced convection principle of heating to increase output by cutting roasting and baking time. Hot air currents circulating throughout the oven's interior at high speed reduce production time by as much as 40 per cent.

Also available to commercial gas users is a new hot water heater with recovery rates ranging from 375 to 2125 gal. per hour through a 100-deg temperature rise. The unit applies a new principle of heat transfer, obtaining faster recovery through use of intermediate water coils which act as a heat exchanger. Gas input may be varied from 390,000 to 2,215,000 Btu per hour.

• A.G.A. Laboratories

Appliance approval testing and field inspection, research and the preparation of standards continued at an accelerated level at the Association's Laboratories in 1959.

More than 5000 gas appliances and accessories were tested, and the Laboratories' "Blue Star" approval seal or Listing Symbol were authorized for display on items complying with rigid gas industry standards.

Heating equipment accounted for more than 50 per cent of the appliance models approved. The Laboratories staff noted a trend toward design of heating equipment incorporating sealed combustion chambers.

The Laboratories intensified its field inspection program, adding six inspectors to its staff. More than 800 announced and unannounced factory visits were made to verify conformance with the standards of Laboratories-approved models. Inspectors traveled more than 150,000 miles during the year to inspect appliances and accessories at the point of manufacture.

Revisions and additions to 20 approval and listing standards, and a new standard covering gas-fired absorption-type summer air conditioning equipment, were adopted by the Approval Requirements Committee and approved as American Standard (ASA).

Also approved as American Standard was the third edition of installation standard Z21.30. This publication, made available late in the year, was extensively revised to include recent advances in gas utilization and provisions covering the installation of piping and appliances for use with undiluted L. P. gas.

Late in 1959, approval specifications for water heaters, central furnaces and floor furnaces designed for installation in trailer coaches and mobile homes became effective. These specifications permit Laboratories approval of such equipment for the first time.

Laboratories' research included 20 PAR projects in the domestic, industrial and commercial fields. These projects included development of a high-speed domestic cooking unit, a transistorized spark ignition device, and the demonstration model of an all-gas furnace.

• Promotion, advertising and research

A.G.A.'s highly effective promotion, advertising and research program (PAR) has completed its 15th year of coordinated gas industry sales promotion, research and public information activities. Hard-hitting national programs in these areas represented outlays of more than $7 million in 1959.

PAR's national print advertising programs placed more than $1.8 million worth of ads in the nation's

Manufacturers tone down 1960 optimism

GAS appliance and equipment makers' opinions as to 1960 sales volumes are in tune with both the current economy and the trends their sales have been following over the past several years.

According to GAMA's Edward R. Martin, business in general no longer views the coming decade with unbridled optimism. Many economists tend to feel that the early Sixties could turn out to be a trouble spot.

In his "1960 General Business Outlook," Martin says "Certainly the entry into the Sixties is somewhat problematical, particularly for the appliance and equipment manufacturing industries.

"It is still too early to fully evaluate the effects of the late 1959 steel strike. It is, however, a matter of record that many manufacturers were caught in a steel pinch which forced them to either curtail production schedules or close their doors entirely. . . ."

Martin points to another factor which may cloud 1960. "The residential construction field, which accounted for 1,320,000 dwelling starts in 1959, looks for lesser activity during the coming year. Estimates range as large a drop-off as 10 per cent. . . ."

In the residential gas appliance and equipment field, many new sales peaks were attained during the past year. Sales of built-in ranges, furnaces, boilers, and automatic water heaters established "all-time" records. Thus, even slight increases in many categories presage new sales peaks in the year ahead:

Gas-fired furnaces—expected to total 1,104,500 units, 0.5 per cent ahead; gas boilers, 142,400 units, up 3.3 per cent; automatic gas water heaters, 3,012,500 units, basically unchanged from 1959's 3,016,000 units; built-in ranges, 431,300 units, up 19.3 per cent.

In June 1959, manufacturers felt that 1960 sales of all gas appliances and equipment would exceed the current year's sales by 3.8 per cent. Their present thinking, reflecting industry's feeling in general, is that overall sales increases will be somewhat less than anticipated, and that 1960 will exceed 1959 by 0.7 per cent.

leading consumer and specialized publications, and more than $3.2 million was invested in the industry's national television program.

In its new alternate-week format, "Playhouse 90" carries the gas industry story into nearly 12 million homes at the height of Thursday's peak viewing hours. By sponsoring the prime first half-hour, the industry is able to direct its demonstrations and sales messages to the greatest number of decision-making viewers. Broader participation in the program by more companies in all segments of the industry now permits A.G.A. to sponsor 32 "Playhouse 90" shows, compared with 26 in the 1958-59 season.

The increased participation in PAR's national sales promotion programs by gas utilities, pipeline companies and manufacturers demonstrates in positive terms the industry's growing determination to maintain and extend its markets. This determination has helped lay the foundation for an entirely new era of gas promotion in which the industry can undertake total promotion of its products and services.

Gas, as an industry, now can conduct major sales campaigns and support them week after week with powerful advertising and promotion at both national and local levels. Gas can bring to bear the combined force of network television, consumer magazine ads, dealer and builder publications, local newspapers and radio, outdoor advertising and point-of-purchase merchandising displays in one coordinated selling package.

The first application of this potent new selling technique is demonstrated in telling fashion by the Gold Star Award campaign. Launched in 1959 on behalf of top-quality gas ranges and eventually to be extended to all gas appliances, the Gold Star program is the largest and most successful gas promotion ever undertaken.

Estimates at the end of the Gold Star program's first year indicate that between 200,000 and 250,000 more top-of-the-line ranges have been sold in 1959. Gas Appliance Manufacturers Association figures on free-standing range sales for the first nine months of the year show that dollar volume increases ran 38 per cent ahead of unit sales increases. Dollar volume was up 9.1 per cent from the corresponding period a year earlier, and unit sales were 6.6 per cent higher.

Other major promotions in 1959 include the new "Blue Star Home" program, in which gas companies representing 21 million meters are establishing the "Blue Star" symbol as the buyer's guide to new homes featuring modern gas living.

As the PAR Public Information program completed its fifth year, A.G.A. activities in developing better public relations for the industry earned national honors for the second time in two years, winning a major award presented by the American Society of Association Executives. Named Grand Award winner in the large national association class, A.G.A. was cited for its "outstanding activities for public service."

A vital area for industry action has been mapped out by a national public opinion survey completed in 1959. Armed with its first detailed appraisal of public knowledge and attitudes regarding the gas business, A.G.A. is spearheading a comprehensive study of the industry's essential public relations needs. This definitive, objective audit will analyze current national and local programs in 1960, making strong, documented recommendations for public relations actions at all levels.

Major emphasis in 1959 was placed on investor relations, telling the facts on government in gas, employee recruitment, a series of six regional public relations workshops, and greater stimulation of coordinated local PR action.

The third annual A.G.A. Public Relations Achievement Award was won by Michigan Consolidated Gas Co., which also earned top honors in the School Activities category. The Detroit gas utility's winning entry was based on its unique educational exhibit, "Gasarama," which in one year was viewed by nearly 150,000 Michigan high school and college students.

The gas industry took another major step forward in 1959 by preparing to treble its research efforts during the next five years. This expansion was recommended by Battelle Memorial Institute following a comprehensive survey of current gas industry research and estimates of future technological needs.

A.G.A. already has taken the lead by increasing its 1960 PAR research budget nearly 40 per cent, from approximately $1.8 million to $2.5 million. This represents the first move toward raising the level of cooperative research expenditures to $6 million a year by 1965. Annual research outlays for the entire industry, including expenditures by A.G.A., individual gas companies, and gas appliance and equipment manufacturers, are expected to advance from the present level of $5 million to more than $14 million within five years.

Research conducted under the PAR Plan in 1959 included nearly 70 projects in the areas of air conditioning, pipeline research, domestic, industrial and commercial utilization, special research, and gas operations.

Two important new items of air conditioning equipment, brought to the prototype stage by PAR research, were turned over to manufacturers for production or further development during the year.

Robertshaw-Fulton Controls Co. has been granted an exclusive license to manufacture and market the free piston engine-compressor developed for A.G.A. by Battelle Memorial Institute.

A long-life gas engine was placed in production by Continental Motors, who developed the new power plant for air conditioning systems under PAR sponsorship.

Research and development also continued on the Swiss 'sorption system being developed by the A. O. Smith Corp., and on an air-cooled absorption air conditioning system, a vertical in-line engine-compressor, new absorption system refrigerants, and new cooling methods.

Researchers at A.G.A.'s Cleveland Laboratories developed a demonstration model of a small, self-contained, all-gas forced air furnace which generates the electricity to operate its own warm air circulating fan. Employing thermo-electric principles, the furnace uses thermocouples which convert gas heat directly

into electricity. Its development opens a wide range of new design concepts for appliances in which gas would serve as the sole source of heat, electricity and mechanical motion.

Projects in gas operations research included continuing development of base load processes for the production of high-Btu synthetic gas from oil shale and coal. Increased emphasis also was placed on gas distribution system leak detection and protection.

Pipeline research projects results in the preparation of design rules for branch connections, studies on the effects of meter tube roughness, development of a device for the non-destructive inspection of steel pipe, and the initiation of research to develop new types of pipeline casings for highway and railroad crossings.

In domestic, commercial and industrial utilization, research centered on the development of range top components, including new burners, thermostats and ignition systems, important advances in water heater corrosion prevention, the development of new high-speed commercial baking and cooking techniques and equipment, and improved equipment and processes for industrial applications of gas.

Impressive gains in the Fifties have strengthened the competitive position of gas in the "battle of the fuels," and even greater strength and growth will come as the industry accelerates and expands its activities in research and sales promotion. On these and on all fronts, the gas industry is moving full-speed ahead, confident that 1960 will be the forerunner of a decade of tremendous progress. ■

L. P. gas sales up 16.5 per cent

SALES of liquefied petroleum gas (butane and propane) in 1959 increased 16.5 per cent over 1958 to 8.7 billion gal. This estimate was released in a year-end review of the L. P. gas industry by George R. Benz, W. F. DeVoe, and Paul W. Tucker of Phillips Petroleum Co., Bartlesville, Okla.

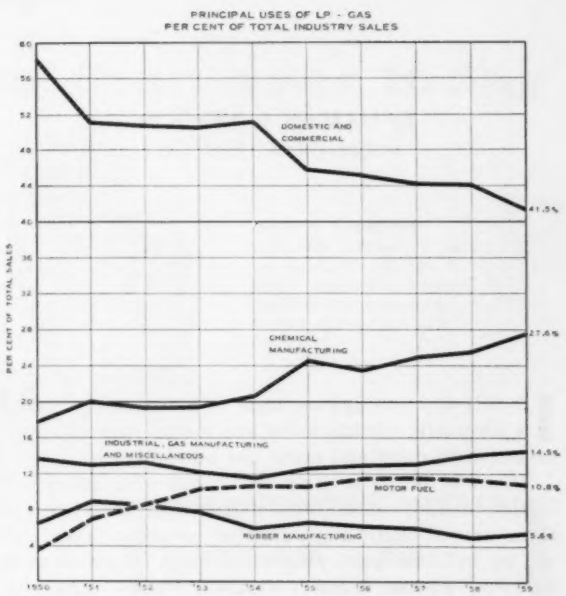
Reflecting increasing markets for petrochemicals, sales of LPG as a raw material for manufacture of chemicals were 26.2 per cent over 1958. They continued to take a larger share of the market, totaling an estimated 2.4 billion gal. This does not include L. P. gas consumed in the manufacture of synthetic rubber, which increased 32 per cent over 1958 to 491 million gal. The volumes used for synthetic rubber components and for manufacture of other chemicals accounted for more than one-third of the total market.

L. P. gas sales for domestic and commercial uses are estimated at 3.6 billion gal., a 9.4 per cent increase over 1958. This continues to be the largest market, although the percentage has dropped from 51.2 per cent of total sales in 1954 to 41.5 per cent in 1959. The most important factor in domestic growth continues to be househeating, as homeowners continue to convert from other fuels to LPG.

Sales of L. P. gas for motor fuel uses increased 10 per cent to a total of 937 million gal., with the largest volume again for use in farm tractors. The use of L. P. gas in industrial lift and tow trucks, however, continues to increase at a faster rate than any of the other LPG motor fuel uses. Cargo truck refrigeration and heating, ready-mix concrete trucks, electric generator sets, and local delivery truck fleets continue to show substantial gains.

Sales of L. P. gas for industrial and miscellaneous uses increased 26.5 per cent to over 1 billion gal., a large factor being greater refinery fuel use.

Sales to gas utilities rose 2.6 per cent to 245 million



gal. Although the extension of natural gas pipelines has caused displacement of L. P. gas in some areas, the overall effect has been to stimulate interest in L. P. gas as well as natural gas and create the need for additional standby plants.

Production of L. P. gas, including the mixed streams going to petrochemical use and refinery fuel, was nearly 18 per cent over 1958. This increase was partly due to more complete coverage of many mixed streams. Eleven new plants came on stream and several others were expanded during the year. An estimated 16 new plants are scheduled for 1960.

Expansion of transportation facilities continued at a more moderate pace than in recent years. Continued emphasis was placed on larger capacity highway transport units, and interest in larger capacity railroad tank cars was evidenced.

Crossing paths

■ ■ *How well do you know the public officials whose paths you must cross?*

By HARLAN P. NEWTON
Boston (Mass.) Gas Co.

IN this day and age we seem to be "crossing paths" with public officials more and more. And the trend seems to be more and more and more!

There is hardly a thing we do but what there is a board, bureau, commission, department, division, section, council, authority, director or some other unit set up by some governmental agency. They want to prohibit, license, permit, regulate, control, authorize, restrict, police, record, sanction, or otherwise direct what we do or can do.

Public utilities are especially subject to this. Not only are they liable to the same duties of corporate citizenship applicable to all other companies, they also are subject to a host of special laws, statutes, ordinances and regulations peculiar to their function as public service companies.

All of these we must live under conscientiously—and at our peril if we don't. This is true, of course, whether we like or see the need for some of these restrictions or not. Our owners, public or private, expect us to do so efficiently and profitably.

In our particular business, we must satisfy our regulatory commission, state and federal, satisfy our legislatures and live in harmony with our local communities. We have to obtain approval of our rates, of our conditions of service, and any changes therein. We need to obtain grants of locations for our lines and structures, get permits to open streets so we can lay and maintain them; sometimes get permission to obstruct traffic, get licenses and permits to store our flammable products, get zoning exemptions, building permits and otherwise operate in a hundred different ways in accordance with the rules in each of our areas.

All of this involves constant "crossing of paths" with public officials. And the public official is the person charged with enforcing these many and varied laws and rules, be he governor or utility commissioner. Or the man I once knew in a New England town who was selectman, chief of police, chief of fire department, assessor, water commissioner, street superintendent, health officer, building inspector, and some other jobs, including field driver and fence viewer.

In a way, it seems to me somewhat futile to pretend to tell utility people how to get along with public officials. The fact is that they are experts and they must be getting along pretty well with them or else fellows like myself, their lawyers, would be spending most of our time getting them out of jail!

Now, what manner of man is this "public official"? Over the years I've met a good many of them and I've found, as I'm sure others have, that by and large they are sincere, responsible and sometimes even dedicated people. They serve the public even as we do.

A fireman's job is to prevent and put out fires; police, to protect lives and property; utility commissioners to regulate our business in the public interest; public works engineers to design and build modern highways and bridges—all the better to serve the public.

Our job as utility people is to deliver our fuels and services to our customer, Joe Public, at a fair and profitable price—and with dependability.

My own observation is that most of our problems with public officials stem from a lack of understanding of each other's functions. And as a corollary, we should add that such difficulties are in direct proportion to such lack of mutuality.

Not long ago a New England town decided to re surface all four miles of its main street. Notice was reasonably given to all utilities to do what had to be done before the street was surfaced. After the work was done, along came a utility company—not gas—and applied for a permit to lay a new facility the whole length of it. I can assure you that this did nothing to enhance the local relations of that utility. And, I suspect the utility's repaving costs were much more than they would have been had the work—admittedly needed—been coordinated with the town's work. And I'm sure every resident of that town mutters when he drives along his main street and sees the 2-ft wide, 4-mile long patch that has not yet blended in and is indeed beginning to show evidence of settlement.

The policeman's lot, it is said, is an unhappy one. I can understand why a police official or traffic commission is even more unhappy when we must excavate a busy street and traffic gets all bottled and snarled up. At least the tears might not be so bitter if we were to give them some advance notice and explanation of what we are doing and scheduling the work so as to lessen their problem, if possible. There is a tendency by some municipalities to insist on utilities hiring policemen to protect their openings. Perhaps

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this stems from what they feel is not outstanding cooperation on our part in giving them advance and timely information. Yet in emergencies, utility men, I find, have the utmost respect of police and fire officials. They look upon our emergency services as akin to their own in knowing what to do, and they will cooperate to the fullest. I think sometimes close liaison with fire and police departments by utilities has been neglected. They will welcome learning how our services can sometimes supplement theirs. This understanding on their part can be fruitful in effectively controlling an emergency situation that could otherwise result in adverse public relations.

Recently my company completed changing over from 640 Btu gas to 800 Btu gas in our central area. We used 600 contractor's men for some six months, calling on 285,000 customers and adjusting their appliances for the higher heat content gas. Before issuing customer public relation releases and news releases, we sent to all appropriate public officials special letters telling what we were going to do and why. After the project was completed, we again wrote the officials, telling them what we had done and how it had worked out and thanked them for their understanding. In the planning stages, and during their execution, we met with city and state officials concerned in order to be sure of good mutual communications. Before we moved into an area, for example, our people called on police and fire officials. Their cooperation was outstanding. Difficult as it is to park, our 600 adjusters found cooperation, not harassment.

Here is an idea of the cooperation received: On "turn-on" day, teams made up of a gas company serviceman, a contractor's man and a uniformed policeman succeeded in gaining entrance to over 300 hard-core "can't-get-in's," without search warrants and often forcefully. Out of these 300, only three major complaints developed and our prompt and honest explanations apparently satisfied even these irate citizens.

Without the wholehearted cooperation of public officials who understood the situation and who were willing with us to put public safety ahead of legal niceties, this would not have been possible.

Formerly a utility often had to develop its own standards and police them. Today we are subject to code requirements in the laying and maintenance of transmission lines, distribution lines, and customers' piping and appliances. Most of these codes are the result of the industry's effort to police itself. Through mutual efforts with others, the utilities are setting ever increasingly high standards for themselves. Many of these industry-developed codes have and are being adopted on a local and state level. Some of it is welcome. But some of these codes, if developed by non-understanding public officials, can be unwelcome and difficult to live under. So it behooves us to see that our liaison with the appropriate authorities is alert and constructive. Again these officials need our help and will welcome our technical guidance in the development of such regulations, if they are convinced that we, too, are well meaning in our endeavors.

More and more in other ways the operations of our public works departments are having an impact on our business. The accelerated Federal Highway Program, said to be the largest public works of all time, is going to affect us more than we like to realize in relocation of our facilities in the way. Many companies already have "horrible examples." Until now, utilities have been largely ignored by state highway departments responsible for developing the program and building the new roads. However, it sometimes seems that their engineers believe that where we have a major transmission or distribution line would be the best place to build a new highway or put in a new bridge. The impact of some of these problems can be enough to bankrupt a small company or stagger even the larger ones. Some jurisdictions allow some relief in the payment to utilities of certain relocation costs. Many do not. None allows complete costs.

Many of these relocations would not be needed if the vital nature of our utility facilities was appreciated by the highway planners as being part of an important fuel artery on which the economics, indeed the well being of a community depend. Liaison with these departments on a "drawing board" basis would relieve and avoid much of this impact. There is some glimmer that our public officials are concerned. They are becoming more receptive to understanding the vital nature of our facilities. In the past they so frequently considered them as "so much pipe"—"Get it out of our way, boys!" I think they would welcome closer liaison with us. We must have closer liaison with them.

These are but some areas where our relations with public officials are of importance to us. There are many other areas where we must "cross paths" with them.

In the long run, of course, we must get along with them and it can only be done through the development of a spirit of mutual understanding. We have got to get to know them. If the mountain doesn't go to Mohammed, then let Mohammed go to the mountain. The job of public relations in this area as in any area is built upon the total effectiveness of all of a utility's employees. After all, we are only the sum total of all of our parts. And so the basic responsibility is in our everyday field relationships. It is the job of each and every one of us whose paths cross those of public officials to develop friendship and understanding in our own areas of work and responsibility. It is not a job that can be tossed into a public relations department's lap. They and top management may be able to guide us and give us backing, but they cannot do the job for us. That we must do ourselves.

I recently asked some of my utility associates how well they knew certain public officials whose paths they had to cross in their respective assignments. I was surprised to learn that the attitude of some was that they didn't know them very well and indeed expressed the feeling that the less they had to do with them the better. But most felt that while some officials may be self-seeking opportunists and some may be well-meaning but incompetent, by and large most were responsible people, and that if you helped them do their job, they would help you do yours.

How well do *you* know the public officials whose paths you must cross? ■

Workmen cut a length of plastic-coated steel pipe being installed as gas line in Fredericksburg, Va.

Plastic-coated pipe installed at high speed

TOUGH, plastic-coated steel pipe has been installed at Fredricksburg, Va. at about 20 times the speed it took to lay the cast iron pipe it replaces. The new pipe was laid at the rate of 8000 ft a day and often was horizontally "jacked" or pushed through unbroken ground.

Scene of the installation for this unique, heavy-duty pipe is one of the nation's oldest residential areas. Having outgrown its existing pipe system, Fredericksburg was "gas equipped" with Republic Steel's X-Tru-Coat pipe. Natural Gas Service Co., contractor on the project, expanded the town's gas service with over 50,000 ft of the new pipe.

Natural Gas Service is not only using new-style pipe, it is using unconventional installation techniques. This time, reports the contractor, it was possible to weld a bull-head to the leading end of pipe lengths, and literally ram them into place by jack-hammer, 20 to 30 in. below the surface. In this fashion, as much as 180 ft of the pipe, welded together, was installed at the same time. Thus, labor and time involved in tearing up the earth and then replacing it again, was eliminated. The customers also were pleased that their lawns were not disturbed.

A big help in this ramming job, it was said, is this pipe's tough, bruise-resistant "skin." It was found that the plastic coat stood up to severe abrasion and other abuse encountered with the unorthodox installation technique.

In areas where the ground was extremely rocky and, therefore, unsuited to the ramrod type of installation, conventional pipe-laying methods were employed.

Trencher makes way for plastic-coated steel pipe.

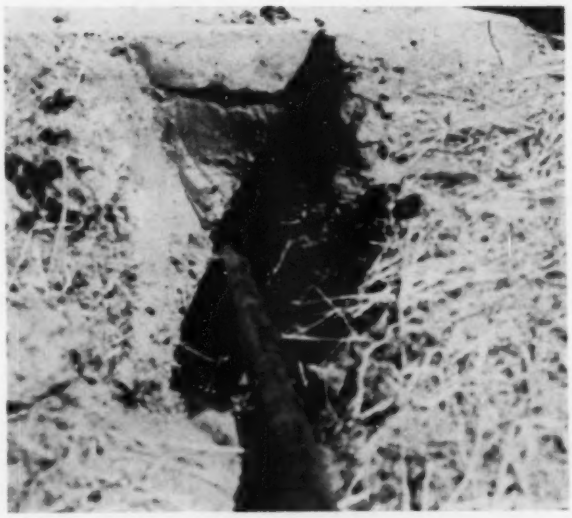
Two lengths of gas service line are welded together to form part of the new gas system.

Handling too, was simplified by the plastic coating, the installer said. The coating did not demand "kid glove" treatment, but resisted abrasion and other damage with less than ordinary care. Thus, workmen disposed of handling chores more quickly.

Protective coating was not damaged by its own weight when stacked. Natural Gas Service found, also, that the pipe coating became neither soft nor sticky in hot weather, nor brittle in cold.

When the plastics skin was subjected to unusually severe treatment, and "holidays" or breaks did occur, pressure sensitive tape was wrapped around the damaged area, simply and effectively, according to the contractor. The tape was also used to protect the field joints where lengths were welded together.

The new pipeline is made up of 4-, 3- and 2-in. X-Tru-Coat installed at a depth of 30 in., and 1¼-in. and ¾-in. pipe installed 18 in. below ground. ■



Above: Plastic-coated steel pipe is jackhammered into position. Time, effort, and money were saved by going under streets and other obstacles.

A field joint where two lengths of the new pipe have been welded together is wrapped with plastic tape.

GAS DISTRIBUTION NEWS

BU forms EDP dept.—new system ordered

A new unit, Data Processing Department, has been set up at Brooklyn Union Gas Co. Edward J. Vetog is manager of it. The move reflects BU's recognition of the growing importance of the field for electronic data processing in gas distribution work. The company recently placed an order for an IBM 7070 electronic data processing system to replace much of the existing punch card equipment. The 7070 will be installed at the same time BU moves into its new office building—1962. A committee-type study group determined the feasibility of the system and its application to Brooklyn Union's operations.

"Static Electricity" new AGA film

Hazards and control of static electricity—both on and off the job—are dramatically demonstrated in a new movie produced by AGA's accident prevention committee, in cooperation with the U. S. Bureau of Mines.

The flicker is in color, on 16-mm film with soundtrack, and takes 22 minutes to show. A major portion of the picture is based on a series of demonstrations developed by G.M. Kintz and H. F. Browne, of the Bureau of Mines. Gasmen will recall this program that was very well received while it toured the country.

Copies of the film may be purchased for $200, plus shipping charges, from the order and billing dept., AGA, 420 Lexington Ave., New York 17.

Philadelphia utility places EDP order

Philadelphia Electric Co. has ordered a new $1.75-million electronic data processing system. Announcement came during the second week of January.

This modern system will be applied to accounting for services used by the utility's nearly 1.4 million gas, electric, and steam customers; data processing for the company's 100,000 stockholders; and its complete payroll accounting. Later, engineering, operating and economic studies will be treated with computer techniques.

The EDP system purchased is a Honeywell-800—a computer capable of handling 96,000 decimal digits per second. It is a fully transistorized system.

A four-year study was made to determine the desirability of using an electronic computer. It is scheduled for delivery in the latter part of 1961.

New water chiller shown

Arkla Air Conditioning Corp. unveiled its new 25-ton, gas-powered direct-fired water chiller on Feb. 1, at the 2nd Southwest Heating & Air Conditioning Exposition in Dallas. The show lasts through Feb. 4. Also shown were: the revolutionary "Gasign"; a new Sun Valley remote domestic air conditioner; and Humphrey multi-directional and room circulators.

Air conditioners included in financing plan

Employees of Ohio Fuel Gas Co., Ohio Valley Gas Co., etc., of the Columbia Gas System have been urged to stimulate gas-fired air conditioning prospects with news that the company's new financing plan covers all domestic type sales of air conditioning.

The plan covers domestic A/C units for both residential and commercial buildings. No down payment is required. Also, the gas companies offer five years to pay. A carrying charge of 6 per cent per year is included.

Arkla-Consolidated merger meets first approval

W. R. Stephens announced that the boards of directors of Arkansas Louisiana Gas Co. and Consolidated Gas Utilities Corp. approved, in principle, the proposed merger of Consolidated into Ark La. Needed now: Approval by stockholders and regulatory agencies with jurisdiction.

Both companies operate integrated natural gas systems; ALG serves perhaps 280,000 customers in Arkansas, Louisiana (northern part), and east Texas. Consolidated serves in excess of 90,000 customers (some at wholesale) in Oklahoma and Kansas. In addition, putting it succinctly, Arkansas Louisiana is engaged in several other businesses.

A stock transfer is involved. And the plan contemplates that Consolidated's facilities will continue to be operated by present personnel.

Drilling with KA-MO . . .

6-in. bore under street —

Drilling 6-in. diameter hole, 40 ft. long under city street for gas line . . . this unit is powered by a 6 h.p. air motor using a standard double-track mounting. Ka-Mo drills are rugged, versatile . . . handle all materials from sand, clay, gumbo to frozen ground, shale, limerock . . . and other mineral formations.

24-in bore inside casing

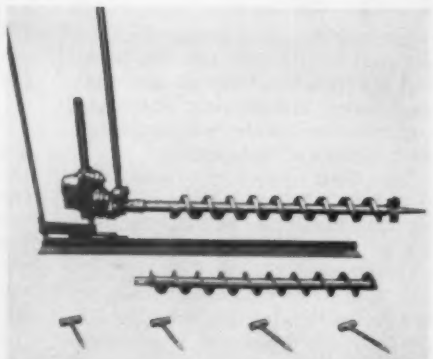
Powered by an 18 h.p. air motor . . . Ka-Mo horizontal drill quickly bored 24-in. diameter hole inside casing, 106 ft. long through compacted clay and ballast under a railroad bed for new gas distribution line. *Actual drilling time . . . only 4 hours!* Casing and drill move forward at same time, protecting against costly cave-ins.

Whether your work involves angular, vertical or horizontal drilling, it will pay you to check the big Ka-Mo line. Drill sizes: 2 to 48-in. diameter, and larger . . . sectionalized lengths . . . air, hydraulic, electric, gasoline or diesel powered.

Light, portable —

Here's a "close-up" of a 6-in. dia. horizontal drill with 6 h.p. vane type air motor and single-track mounting. It's light, portable, easy-operating. Speeds installation of distribution and service lines under walks, streets, railroad beds, etc. Other sizes in this series: 3 to 14-in. dia., in sectionalized lengths, with single or double-track mounting.

Special engineering service always available on difficult drilling or boring problems. Call any time!



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1960 prospects look good

SEVERAL developments are expected to brighten gas industry prospects this year, according to The Value Line Investment Survey. These developments are:

1. FPC will rule that a 6½ per cent rate of return on investment in utility property is fair and reasonable. The study bases this on the overwhelming evidence of its necessity; the already approved returns of 6¼ per cent; and the fact that a number of states already allow returns above 7 per cent.

2. The commission will outline a fair and workable formula for the pricing of gas in the field. The Value Line thinks this method will probably be based on pricing gas area by area.

3. Federal courts will uphold the right of gas producers to retain tax benefits stemming from intangible drilling costs and percentage depletion, plus a "normal" return on their investment. This, the Value Line believes, would not result in any earnings gains (as now reported). Rather it would remove uncertainty as to the treatment of these savings.

4. Several pipelines will work out voluntary rate settlements with their customers, which will get FPC approval. If the FPC itself does not soon resolve this issue, the trend to settle will speed up. Though such settlements would result temporarily in lesser reported earnings, in many cases they would set the stage for further substantial growth.

5. A federal court will rule that pipeline companies are not subject to most of the provisions of the antitrust laws. This, the survey says, would clarify the extent of FPC jurisdictions over mergers, acquisitions, etc.

6. Canada's National Energy Board will authorize exports of gas from Canada almost three times the present level.

The gas industry may not achieve in full all these looked-for favorable developments. But, The Value Line Survey concludes that 1960 should be a more satisfying year than 1959 with a firming of earnings and the establishment of a solid base for future profits growth.

Gas main centennial

Two local youngsters, elected to represent Tom Sawyer and Becky Thatcher, beloved Mark Twain characters, participate in ceremonies in front of author's boyhood home in Hannibal, Mo. to mark centennial of the city's first cast iron gas main. "Tom" holds a section of the main laid in 1859 and still in use. Norman Wakeman, editorial director of the Cast Iron Pipe Research Association presents Mayor Clyde Toalson with plaque signifying Hannibal's membership in the association's Century Club. At right is E. D. V. Dickey, for 40 years manager of Citizens Gas Co. in Hannibal.

Pennsylvanians discuss district regulators

The Distribution Committee of the Pennsylvania Gas Association is planning a one-day spring conference on March 31. Theme of the meeting will be "Design, Operation and Maintenance of District Regulator Stations."

Morning session will be highlighted by presentation of papers while the afternoon will be devoted to a panel discussion on district regulators.

Meeting place is the George Washington Motor Lodge at King of Prussia, Pa. (located at the Valley Forge exit of the Pennsylvania Turnpike).

Ontario has new code

Ontario Energy Minister Macaulay said that a new natural gas safety code for the province will become effective early this year.

"It is designed to provide a reasonable degree of safety, but without an untenable degree of interference and unburdenable costs," he said.

LOW AND NARROW! **Parsons® 77 Trenchliner®**

It's not much wider than a yardstick...

... only 3 feet-10 inches wide, to be exact! What's more, this new 77 is just 5 feet-8 inches "low" with the boom in digging position. It only weighs about 6700 lbs., for convenient trailer-transport from job to job.

Trench depths to 5 feet

Small in size, but big in capacity, Parsons 77 has a work range that will surprise you. It produces from 4.4 inches to 21 lineal feet of trench per minute, in 32 hi-lo digging speed selections. You get trench widths from 6 to 18 inches — *and maximum digging depth of 5 feet!*

The tiny 77 is heavy-duty in every respect. It has positive down-crowd on telescopic ladder boom. Self-cleaning, cast steel buckets have self-sharpening removable point-type teeth. Shiftable conveyor is instantly reversible for controlled discharge. Compact and maneuverable, the 77 turns within its own length — each crawler is independently driven, independently braked. Better check what this small utility Trenchliner can do on your service lines, small mains, footings, etc. Ask Parsons distributor for demonstration, or write to us for literature.

A big, expensive rig isn't needed to transport this little 77 Trenchliner from job to job. Its low height and weight of only 6700 lbs. — permit fast one-man trailer loading — hauling under low overhead clearances. (Big ladder and wheel-types are also available.)

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Oklahoma Natural plans merger

Northern Oklahoma Gas Co., Ponca City, plans to merge with Oklahoma Natural Gas Co., Tulsa.

Merger will be completed through an exchange of four shares of Oklahoma Natural stock for five shares of Northern common.

Northern's plant value is estimated at $9.5 million, with gross earnings of $3.4 million annually. It serves 40,000 customers in Ponca City, Newkirk, and Perry.

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Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

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Suggestions pay off

Charles L. Mee (left), chairman of Northern Illinois Gas Co.'s employee suggestion system, congratulates winners of awards for the year's best ideas. They are from left: Jake O. Ruder, company foreman, who devised shut-off equipment which enables removing lateral connections from mains without interrupting service to customers. Frank A. Kasperkevicz, maintenance foreman, who improved the design of a stopper for high pressure gas mains. O. Keith Kennedy, system protection advisor, who suggested a centralized control and machine preparation of letters cautioning contractors to avoid damaging gas mains and service lines. George M. Long, senior engineer, whose suggestion to change distribution pressure charts at 2-week intervals instead of every seven days saves manhours and reduces transportation costs.

Ready for winter

East Ohio Gas Co. was prepared for the onslaught of winter with an all-time high of 83 billion cu ft in underground storage. This is a 10-billion increase over last year. The company has three major storage pools: Chippewa, Columbiana, and Stark-Summit. The latter is the world's largest.

Milwaukee Gas expands

Milwaukee (Wis.) Gas Light Co. wants to buy Central Wisconsin Gas Co., serving 2800 customers in Sparta, Tomah, and Waupaca. Milwaukee would pay $388,500 by acquiring capital stock at $290,000 and assuming a $98,500 mortgage. This is the first expansion for Milwaukee Gas outside of metropolitan Milwaukee, Port Washington and West Bend.

Pennsylvania still fights spiraling costs

Pennsylvania's PUC is continuing its fight against gas pricing spirals. The commission has gone on record as opposing federal failure to curb wholesale rate increases that start in other states, and are responsible for gas prices spiraling in Pennsylvania.

"The cycle begins," said the PUC, "when the out-of-state producer, over whom the (Pennsylvania) commission has no jurisdiction, raises its price to the . . . transmission company, which, in turn, passes it on to the Pennsylvania utilities by filing an increase with the FPC.

"Each time the wholesale price goes up for utilities . . . they are compelled to come to the state commission for increases in consumer rates in order to recoup."

Since the recovery of higher wholesale costs does not represent an increase in earnings, the commission is "left no alternative under the law" but to increase consumer rates.

Pennsylvania has intervened six times during the past year in rate cases before the FPC.

"We have filed a brief with the U. S. Supreme Court," the PUC said, "in an effort to reverse the FPC and the (Circuit) Court below, because . . . states like ours are helpless in dealing with filings . . . by utilities to meet increased cost of wholesale gas." The commission cited the recent ruling of the Third Circuit Court of Appeals which upheld the position of natural gas producers that they are not required to justify the initial prices.

"We have told the Supreme Court that if producers are not required to justify increases to pipelines, the incessant spiral of higher gas prices will continue ever upward. Unless the Circuit Court decision is reversed, this condition must continue. . . ."

Adds to line

Seabrook Machinery Inc., Tallahassee, Fla. and Albany, Ga. has added Hydrocrane machines to the line of excavating and crane equipment it distributes for Bucyrus-Erie Co., So. Milwaukee. Seabrook covers north central Florida and southwestern Georgia.

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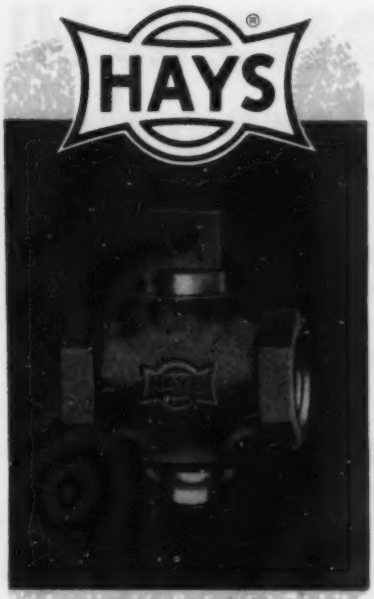

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Aerial view of LILCO's new $3 million operations center. In foreground is office building with parking space at its rear for 850 vehicles. Shops and stores, and transportation buildings are behind 3-acre outdoor storage area.

LILCO opens new operations center

The new $3 - million, 25 - acre Brentwood Operations Center of Long Island Lighting Co. is in full operation. About 700 employees—200 in customers' service, new business, commercial and meter test departments, and 500 in field crews, dispatching, customer servicemen etc.—are headquartered there.

The office building has 65,000 sq ft of space and includes a cafeteria seating 200 persons. The transportation and garage building has 14,500 sq ft of floor, and the shops and stores building has 18,-700 sq ft. Outdoor storage area extends over three acres. In addition, there is parking space for more than 300 LILCO vehicles and 550 employees' cars.

NI-Gas storage approved

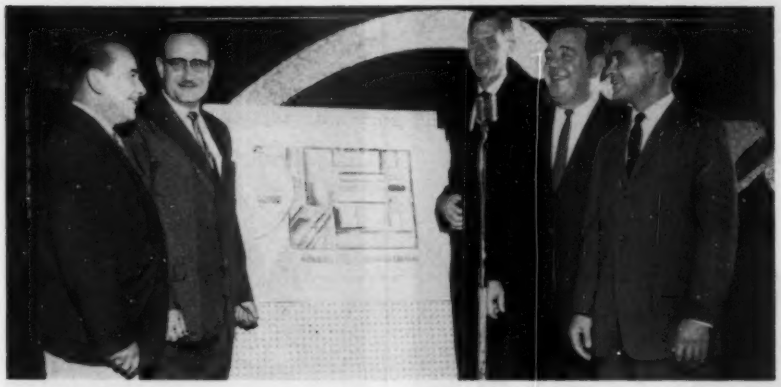
Northern Illinois Gas Co. received Illinois Commerce Commission approval to operate its Troy Grove storage reservoir in the 1960-61 heating season. Permission also was granted for further development of the facility. NI-Gas may now test a larger area of the porous sandstone some 1500 ft below the surface. Natural gas injection has been going on since July, 1958. The 4-billion cu ft mark was passed late last year.

Gas blamed for under 3% of U.S. fires

Less than 3 percent of building fires in the U. S. in 1958 were attributed to gas and gas appliances. According to AGA, fires totaled 866,700; gas caused 25,000. Losses in building fires were estimated at $1056 million. Of this, gas was charged with 2.1 per cent of the loss, an estimated $21.9 million. Gas-fueled equipment was blamed for 15,000 of the 193,000 fires caused by defective or overheated cooking and heating equipment in '58. In dollars, gas equipment was charged with $12.3 million of the total $149.2 million in this category. Gas and gas appliance fires, including explosions, were estimated at 10,000, for a $9.6 million loss.

Gas sales almost doubled

A 44 per cent increase in gas sales was registered by Northern Ontario Natural Gas Co. Ltd. at the end of 1959 over 1958. The Toronto company's daily sendout to its nearly 10,000 customers was in excess of 100 MMcf. During the year, over 40 per cent of the small industrial and large commercial customers were placed under contract.



CGA cuts testing fees

Testing fees for new gas-fired appliances are being reduced by 10 per cent this year, according to the Canadian Gas Association. Managing Director W. H. Dalton said this was the minimum reduction manufacturers of gas equipment could expect. The figure is based only on an average of all models processed through CGA labs. "In many cases," Dalton said, "this reduction will amount to more than 10 per cent."

Strong combination

Utility, manufacturer, newspaper and radio get together in Honolulu to kick off Caloric Appliance Co.'s new Beatrice West color-correct kitchen promotion. More than 300 architects and builders attended a dinner at the Hawaiian Village hotel recently to get details. Pictured here are (from left): H. W. Magnuson, general sales manager of Honolulu Gas Co.; Sandy Weintraub, of the Honolulu "Advertiser"; James C. Stopford, president of Honolulu Gas; Lucky Luck, Honolulu radio personality; and LeRoy Klein, vice president in charge of Caloric Appliance sales.

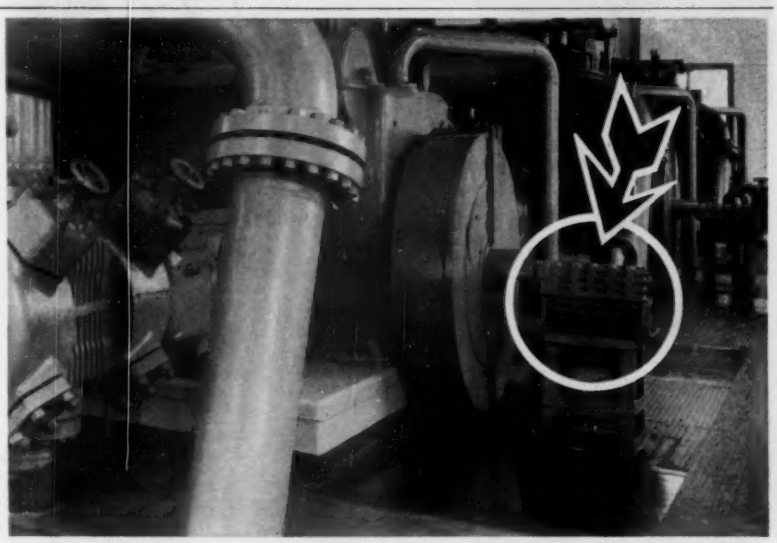
Vancouver Island system planned

Plans for a $16.6 million gas distribution system to serve Vancouver Island points have been filed with the province's PUC. Island Transmission Co. will build the system and install the pipeline from the mainland.

Island Transmission is opposing an application by Magna Pipeline Co., which plans a flexible submarine line across the Strait of Georgia. The companies at one time planned a joint line. Island Transmission, however, lost interest because it said the proposed line would take too long to construct.

Division has new name

Minneapolis-Honeywell Regulator Co. has changed the name of its Beltsville, Md. operation to the Industrial Systems Division. The Maryland plant produces analog and digital magnetic tape systems and components. It has been known as the Davies Laboratories Division since its acquisition in 1956.



Berry Hydraulic Fan Drives used in remote control compressor station

The Texas Eastern Transmission Corporation compressor station at Linden, N. J., is controlled by an operator 40 miles away. This main line station has 2050 BHP Clark turbo-charged, gas-engine-driven compressors.

A Berry Hydraulic Pump is directly connected to the crankshaft of each engine and supplies fluid power to drive its related aerial cooler fan. Each fan is directly mounted on the shaft of a Berry Hydraulic Motor. This unitization helps maintain constant jacket water temperature automatically, regardless of engine loading, ambient temperature, etc., by a control in the hydraulic system.

NOW . . . 21 internal gear ratios

To reduce installation costs Berry now offers 21 internal gear ratios. This permits direct connection of hydraulic pumps at prime mover speeds from 250 RPM to 1750 RPM. Hydraulic motors may be direct connected to fans, water pumps, etc., from 100 to 2000 RPM.

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There's no cloth lining, no fabric failure . . . gas meters can keep operating at the speed they were designed for! No need to hurry up meter wear.

Lancaster's superior synthetic materials are also available in these diaphragms: C-1-L for #1 Ironclad, O-L for #0 Emco and #1-L for #1 Emco Meters.

Increase meter accuracy . . . without increasing meter wear —Order Lancaster Synthetic Diaphragms!

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Welfare symbol

Gas light helps convey welfare agency's symbol. This white-domed gas light illuminates the Family Service office in Cuyahoga Falls, Ohio. E. J. Burke, supervisor of sales for East Ohio Gas Co. in Akron, is a member of the board of directors of Family Service. He pointed out that the gas light is especially appropriate for the office because the Family Service, a United Foundations agency, has an eternal flame as a symbol.

Humphrey line moves to Evansville plant

Merger of Humphrey gas heaters into production of its expanding line of gas equipment has been achieved by Arkla Air Conditioning Corp.

Humphrey's production facilities were moved from Kalamazoo, Mich. to Arkla's Evansville, Ind. plant. There they have been dovetailed with manufacture of gas air conditioners, water chillers, gas lights, signs and other products.

The acquisition of Humphrey, said general sales manager W. G. Wepfer, "was in keeping with Arkla's plans to expand into a full range of gas-operated heating and air conditioning products. . . ."

Texas agent named

Blaw-Knox Co., Buflovak Equipment Division, has named Werlla & Co. as sales representatives for its gas conditioning equipment. Headquartered in Houston, Werlla's territory is in central and south Texas.

NI-Gas offers gas heat to all comers

All residential customers of Northern Illinois Gas Co. who want gas heat during 1960 may have it. NI-Gas asked Illinois Commerce Commission approval of its plan to offer gas heat to as many as 80,000 single-family homes. These permits would provide for all applications expected through 1960, according to NI-Gas vice president H. A. Diekmann.

The company's plans are based on expected additions of 147 MMcf to its daily pipeline supply for the 1960-61 heating season.

Approval is also sought to allocate 75 MMcfd for heating other types of buildings. This would provide gas heat to about 15,000 multi-unit residence buildings and all types of non-residential buildings. All new buildings for which application is made in 1960 will be able to get gas heat.

Diekmann pointed out that existing apartment buildings, schools, and commercial and industrial buildings will get gas heat only if gas air conditioning is installed or if the heating equipment's hourly gas input is under 350,000 Btu.

Automatic controls have bright future

A significant trend toward "programmed" controls for home appliances and a vast "hunger" by Europeans for automatic appliances point to a bright future for automatic control devices.

T. T. Arden, president of Robertshaw-Fulton Controls Co., said that during the 1960's, devices previously limited to use in expensive industrial control systems will be incorporated in many types of equipment for the home. These "programming" controls will be able to make decisions, in addition to simple "on-off" selection.

Plan ethylene production

SunOlin Chemical Co.'s North Claymont, Del., facilities are being expanded to include manufacture of ethylene. Dry gas from Sun Oil's Marcus Hook, Pa., refinery will be used for producing ethylene. Ultimate capacity will be nearly 200 million lb a year.

CUT 20" CAST IRON PIPE
in Less Than 8 Minutes...

...with the New REED
ROTARY CUTTERS

(4 sizes cover the range from 20" cast iron to 36" steel pipe)

These one-man Reed Rotary Cutters cut large diameter steel or cast iron pipe *faster and better than the heaviest power machines* . . . and without electrical or explosive hazards. What's more, there's less digging in ditch-work! You need only a 4" to 6" channel under the pipe and a 45° to 60° arc for the handle swing. Reed Rotaries are easy to "carry in", too. The 20" size weighs only 68 pounds; separates into 3 easily carried parts. Patented pipe guide assures clean, right-angle cuts. Four razor blade wheels track perfectly, cut easily and are quickly interchangeable for steel or cast iron pipe.

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These typical cuts on 12, 16, 20 and 24" cast iron pipe illustrate the clean, accurate, right-angle cuts provided by Reed Rotary Cutters.

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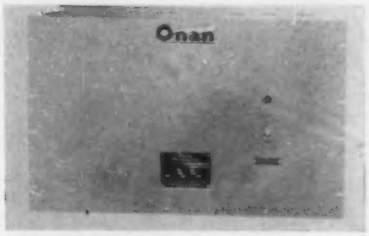
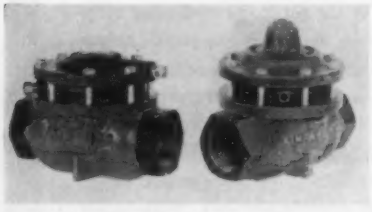
New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 85, 86



1. Microwave power unit

Onan is producing its Instapac, a transistorized inverter power unit for microwave communication emergencies, in a compact size. The unit is now offered in either 19-in. relay rack mounting, with needed controls; or optionally, in a wall-mount cabinet. Instapac comes in 3 input voltages: 24, 36, and 48. The unit also is offered with such items as a battery charger, meters, and an output booster. *GEC 140*
D. W. Onan & Sons Inc.



2. Motor valves

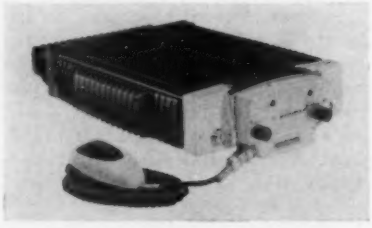
Kimray has added the "5:1" series motor valves to its line of gas and oil equipment and controls. Until now, most low pressure Kimray valves had full line size inner valves. The 5:1 series has reduced inner valves, with the area 30 per cent of full line size. This allows the series to be used on gas and oil separators and liquid meters where a 30 psi maximum pilot supply is available to actuate valves operating up to 125 psi. *GEC 750*
Kimray Inc.

3. Pressure switch

A new sub-miniature, adjustable pressure switch is offered by Bristol. It exceeds requirements of MIL-E-005272B for performance up to 200 psi under vibration, shock, and acceleration test conditions. For electrical switching in response to pressure changes in gas or liquid, the switch is particularly suited to applications in which performance with minimum size, weight, and cost is important. *GEC 200*
Bristol Co.

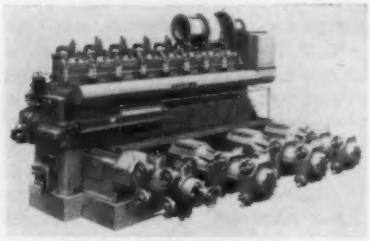
4. Built-in oven

The MicroRay burner, featured in Hardwick's free-standing range, is available this year in built-in ovens. The oven is equipped with a thermostatically controlled, live-flame rotisserie so that it roasts and barbecues as well as broils and browns. While MicroRay operates, the conventional oven bakes breads, pies, and all manner of food so that tremendous meals can be prepared simultaneously. It operates on a radiant heat principle. *GEC 240.*
Hardwick Stove Co.



5. Two-way radio

An expanded line of extensively transistorized MOTRAC radios has been introduced by Motorola. The new line includes models for operation from either 6- or 12-v sources. It consists of 25- and 50-watt units in the low band frequencies and 30-, 60-, and 80-watt units for high band frequencies. External heat radiators are used in the new radios to dissipate heat from the few remaining tubes and the power transistors. *GEC 140*
Motorola Inc.



6. Turbocharging kit

Clark's complete field turbocharging conversion kit is designed for the majority of models in its RA and HRA gas engine-driven compressor lines. Depending on model, size, shaft diameter and other design criteria, hp increases range from 32 to 50 per cent on the RA series, and from 20 to 36 per cent on the HRA. *GEC 160*
Clark Bros. Co.

7. Aluminum meters

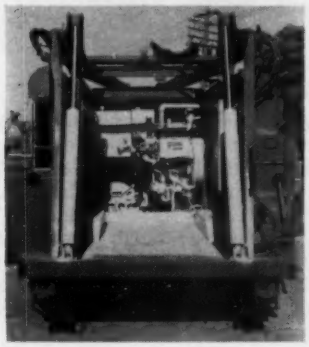
Two light-weight, large capacity, single-joint aluminum gas meters have been added to Rockwell's line of aluminum meters. The "3000" is rated at 3000 cfh and 1400 cfh at the 2-in. and ½-in. w.c. differential respectively. The "10,000" is rated at 10,000 cfh at the 2-in. and 4700 cfh at the ½-in. differential. The large model has 100-psi working pressure yet weighs only 310 lb. The "3000," with a 100 psi working pressure, weighs but 100 lb. *GEC 560*
Rockwell Manufacturing Co.

8. Cluster gas lamp

Modern Home has introduced its multi-operational gas lamp for public structures, prominent buildings, etc. The entire post and 5-lamp cluster is made of cast aluminum and is available in all colors. Overall height is about 9 ft; overall width, 41 in. *GEC 470*
Modern Home Products Co.

9. Built-in top burner

A new built-in top-burner gas range from Caloric is styled to combine attractive appearance with efficient operation. Among features are: countertop controls, located at right side of unit for easy visibility and operation; color-coded burners, coded to the proper control; hinged top for easy cleaning; increased cabinet space due to minimum depth of range. *GEC 240*
Caloric Appliance Corp.



10. Power unit

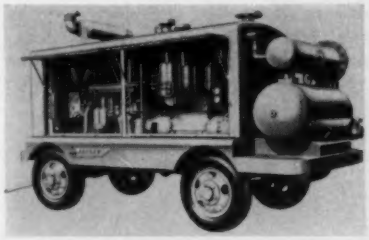
Holan has designed a unit to power all the hydraulic equipment needed on a utility construction body and made it an integral part of the new Uni-Power body. Holan builds the body, power plant, and all hydraulic equipment as a unit. The complete package is then bolted to the chassis. This "power package" consists of a 56-hp 4-cylinder air-cooled engine, a hydraulic winch, and a tandem hydraulic pump. *GEC 790*
Holan Corp.

11. Pipe finder

Reduction of maintenance costs by 90 per cent were reported in field tests of new transistorized pipe and cable finder instruments conducted by Fisher Research. The 1960 model M-Scope pipe finder has hermetically sealed transistors and printed circuits. Battery life averages more than 1500 hours of continuous operation. *GEC 640*
Fisher Research Lab. Inc.

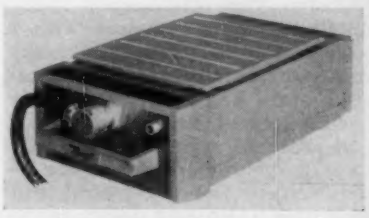
12. Data reporter

Burroughs' new tape-punching machine is aimed at reporting transactions from branch offices, field locations and other remote centers to a centralized data processing system. The P11 is an electro-mechanical device with up to 13 columns of keys, printing and adding, plus rotary date and rotary numbers where needed. Some uses include listing bills paid, meter readings, payroll data from branch offices, gas runs, etc. *GEC 180*
Burroughs Corp.



13. Air compressor

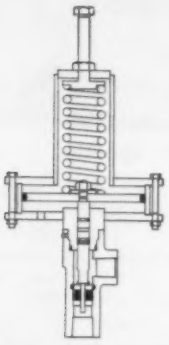
Jaeger's new rotary air compressor delivers 900 cfm of air at operating speed of only 1700 rpm. A 100-rpm reduction in engine speed results in a fuel factor of more than 500 cfm of delivered air per pound of fuel consumed. Engine and compressor wear also are reduced. *GEC 010*
Jaeger Machine Co.



14. Two-way radio

A new transistorized two-way radio from Bendix is designed for cars, trucks, and other vehicular applications. The new "2V Series"

is similar in basic design to the Bendix "2R" railroad radio. The new radio's strong points are its ruggedness, reliability and ease-of-servicing. It uses transistors and printed circuits extensively. *GEC 140*
Bendix Radio Division



15. Dump valve

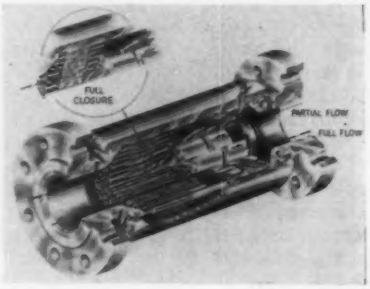
Apco's new type dump valve incorporates a piston motor to provide greater power in a more compact package. The "Check-Stream" is engineered to stop leakage by providing a more positive means of shutoff. A solid rubber cylinder, expanded against the body liner by the piston motor, provides leak-proof shutoff and eliminates the major cause of dump valve failures. *GEC 820*
Apco Division

16. Service saddle

Joslyn Type 310 service saddle applies clamping pressure with a wide laminated strap, terminating in a short square bend "U" bolt at each end. This provides a very flexible tension member which will give close fit regardless of variations in pipe diameter or pipe irregularities. The effective range of pipe sizes which each Joslyn saddle can handle is thereby materially increased. The saddle is adaptable for use with all types of pipe within its rated size. *GEC 370*
Joslyn Mfg. & Supply Co.

17. Meter reading case

Any utility using punched cards for billing will have the job of preparing these bills greatly simplified by a new meter reading case. Wright Line's case holds 300 or more cards arranged in the order followed by the meter reader. He writes the meter figures on the card with a special sensing pencil, then inserts the card in the bottom of the case. *GEC 600*
Wright Line Inc.



18. Silent valve

Aeration, cavitation, surging, vibration and the resulting noise—all undesirable physical phenomena associated with rapid flow of liquid —are said to be virtually eliminated by Aerojet-General Corp.'s new silent valve. Aerojet believes the new valve will lower maintenance costs while boosting the efficiency of an entire system in many fields, including gas. The valve can be supplied for installation in systems with line sizes from 1-in. to many feet in diameter. *GEC 820*
Aerojet-General Corp.

19. Free-standing ranges

O'Keefe & Merritt has added the 8100 Series to its Starline free-standing ranges. The new series is distinguished by double open-view doors to oven, broiler, and storage compartments. This type of opening makes it easier to reach interiors for cleaning and use. Line features one-piece lift top. *GEC 240*
O'Keefe & Merritt Co.

20. Pipe joint compound

Tite-Tred is a new compound for thread and joint applications. It does not contain lead, graphite, or metallic materials. According to Overton Sales, the new compound does not harden nor stiffen in low temperatures. It is recommended up to 350 deg. F. *GEC 730*
Overton Sales-Equipment

TRADE LITERATURE

21. Dehydration units

Pritchard Hydryers — packaged dehydration units—are covered in a 4-page bulletin (No. 160-1). The units are for air, gases, and liquids in all industrial, processing, and laboratory installations. *GEC 270*
J. F. Pritchard & Co.

22. Pick-up compressor

A new 6-page bulletin from Cooper-Bessemer describes the DM-125 packaged compressor (300-hp class). Bulletin 92 reviews the need for small hp, heavy-duty integral engine-driven compressors specifically designed for field gathering service. *GEC 160*
Cooper-Bessemer Corp.

23. Service centers

How Univac service centers solve everyday management problems for businesses is the subject of a colorful, illustrated 6-page folder from Remington Rand. *GEC 180*
Remington Rand.

24. Butterfly valves

A 36-page catalog describes iron body, rubber seated butterfly valves and operators from Darling Valve. The valves are designed for hydrostatic operating pressures up to 125 psi and velocities up to 16 ft per second. Complete data on construction and design, dimensions, general hydraulic data, etc., are contained in Bulletin 5904. *GEC 820*
Darling Valve & Mfg. Co.

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GAS DIGEST

25. Analog computers

Computer Systems Inc. has a new 4-page brochure describing its line of general and special purpose analog computers and accessories. Included are descriptions and specifications on the Precision Master and Process Master analog computer; electronic multiplier, XY-data plotting boards; linear programming computers. *GEC 180*
Computer Systems Inc.

26. Butterfly valve

The new Monoflange Mark II rubber-seat butterfly valve from Henry Pratt Co. is the subject of Bulletin 10 CV. The catalog is designed as a working tool for engineers and users of this type of equipment. Complete specifications, certified dimensions, gas flow data, etc., are included. *GEC 820*
Henry Pratt Co.

27. Tractor shovel

A new 16-page, 3-color catalog from J. I. Case describes features and performance of the W-10 Terraload'r. Both operation and construction of the 6500-lb capacity rubber-tired tractor shovel are described and illustrated. *GEC 210*
J. I. Case Co.

28. Vibration meter

SIE Model T-1A vibration meter is described and illustrated in a new bulletin. The meter, designed for accurate measurement of the velocity, displacement amplitude and acceleration of vibration, is suitable for gas pipelines. *GEC 540*
Southwestern Industrial

29. Packaged compressors

Construction and operating features of Cooper-Bessemer AM/2 and AM/4 packaged compressors are in a new 8-page bulletin. The incorporation of large compressor concepts in these compact, heavy duty units is discussed in Bulletin 91. *GEC 160*
Cooper-Bessemer Corp.

30. Steelmaking

Kaiser Steel has published a 16-page illustrated booklet describing a technological advance in steelmaking—the production of basic oxygen steel—at its Fontana, Calif. mill. Construction and operation of the oxygen steelmaking furnaces are described, and a brief history of the new steelmaking process is given. *GEC 450*
Kaiser Steel Corp.

31. Pipelayers

A new two-color booklet describes Caterpillar No. 572 Series D and MD7 pipelayers. The 4-page brochure describes some of the new features of the pipelayers, including increased hp, dry-type air-cleaner and life-time lubricated rollers. Brief specifications and other design features are also listed. *GEC 210*
Caterpillar Tractor Co.

32. Chemical index

The fifth edition of the Reilly Chemical Index has been published. It contains a comprehensive listing of the chemicals produced by Reilly, listed alphabetically and according to classes. *GEC 450*
Reilly Tar & Chemical

33. Industrial valves

Lunkenheimer has revised its comprehensive 500-page valve catalog, "Catalog '60." Featured in this most complete catalog is a special 24-page Valve Selector and over 100 pages of engineering data. The illustrated and thumb-indexed Valve Selector Guide groups valves according to pressure classifications. It enables engineers to find specifications, reference data for any Lunkenheimer valve. *GEC 820*
Lunkenheimer Co.

34. Two-way radio

G-E's new transistorized Progress Line two-way radio equipment is covered in a new bulletin (ECR 666). The publication describes how small size (8½ in. wide, 12 in. long, 4 in. high) makes possible a wide variety of positions in which the equipment may be mounted in cars and trucks. *GEC 140*
General Electric

35. Valves, fittings

Pertinent data on oil and gas field drilling and production valves,

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fittings, well control equipment and accessories are included in a new catalog from Kerotest. *GEC 300*
Kerotest Manufacturing Co.

36. Air processing

A new 12-page bulletin from J. O. Ross includes data on ovens, dryers, air heaters and curing systems for use in a variety of industries. Also included are six case histories covering tough drying or curing problems solved by properly engineered equipment. *GEC 400*
J. O. Ross Engineering

37. Abrasive research

Performance and statistical data compiled in abrasive research and experimentation is contained in a new "Handbook of Blast Cleaning Abrasive Performance." *GEC 570*
Wheelabrator Corp.

38. Air cleaner

Dollinger's new Hi-Velocity electronic air cleaner is discussed in a 12-page bulletin. Descriptive diagrams, photos, and specifications are in Bulletin 405. *GEC 350*
Dollinger Corp.

39. Rotary compressor

A new 4-page bulletin describes Davey's Model 600 RP Hydrovane rotary compressor. Contents include complete specifications, action photos and a listing of design features. *GEC 010*
Davey Compressor Co.

40. Rotameters

Pneumatic transmitting rotameters from Schutte & Koerting are covered in Bulletin 18N. Included are photos, sectional drawings, and information on materials of construction, operation, and application. Characteristics of the transmitter unit, dimensions, and maximum capacity ranges also are presented. *GEC 540*
Schutte & Koerting Co.

41. Physical properties

A 28-page physical properties book describes more than 400 synthetic organic chemicals. Union Carbide's new booklet contains information on applications, physical properties, and shipping. *GEC 450*
Union Carbide

42. Materials handling

A new folder outlines the advantages of trucks engineered and manufactured for specific plant and warehouse materials handling problems. All trucks are designed and built by Palmer-Shile to customer specs. *GEC 530*
Palmer-Shile Co.

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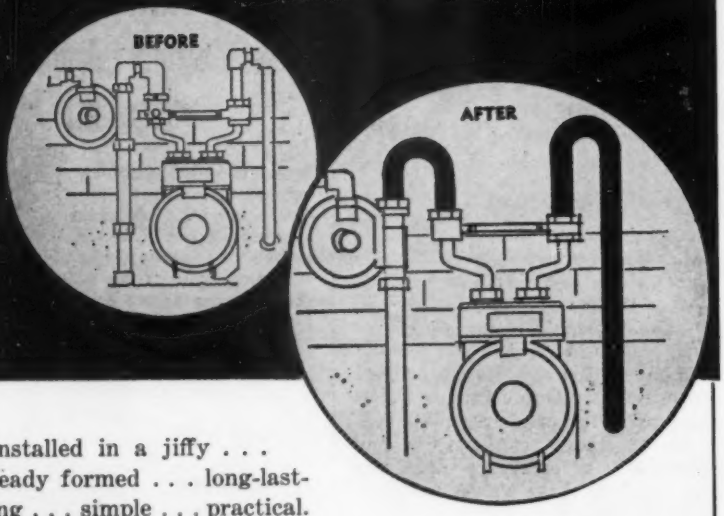

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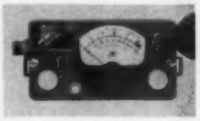

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GAS • PEOPLE

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J. R. Elliott
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Several appointments have been announced by Pacific Lighting Gas Supply Co., Los Angeles. W. D. MORNINGSTAR is assistant vice president and assistant treasurer; J. R. ELLIOTT is secretary; and ROBERT L. WEIL is auditor, Morningstar's former post. Elliott continues as assistant counsel for the company.

EBERT B. MUELLER has been elected to the board of directors of Mueller Co., Decatur, Ill. He has been with Mueller Ltd., the Canadian subsidiary, since 1934, and serves presently as assistant to the sales manager of the water works department.

W. E. OTIS is contract and marketing administrator of Grayson Controls Division, Robertshaw-Fulton Controls Co. He headquarters in Long Beach, Calif.

WENTWORTH SMITH has been raised to marketing vice president of Neptune Meter Co., New York. Smith has been a vice president of Neptune and formerly headed the company's liquid meter division. JOHN J. CARROLL, also a vice president and formerly in charge of liquid meter sales, was promoted to general manager of the liquid meter division.

Robert Weil
PLGS

E. B. Mueller
Mueller

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THE BEST
DITCH WITCH TRENCHER

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Other trenchers dig *"More or Less"*

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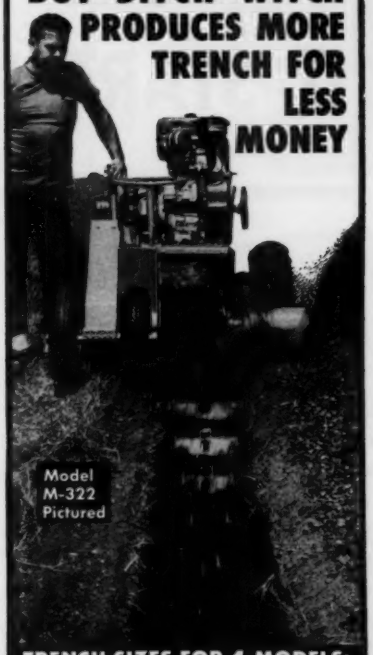

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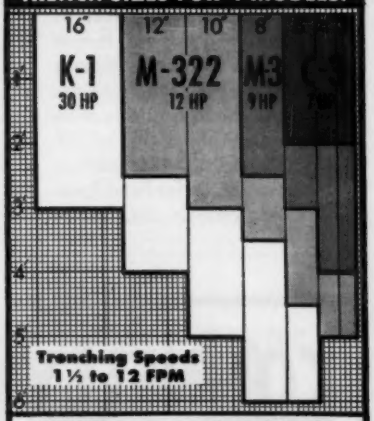

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HORTON L. CHANDLER and ROY E. WRIGHT have been named vice presidents of the NEGEA Service Corp., Cambridge, Mass. Chandler is vice president - relations and Wright is vice president-sales.

CHARLES A. BOGENRIEF has been elected vice president, manufacturing, of Robertshaw-Fulton Controls Co., Richmond, Va. He has been director, facilities and tooling. From 1942 until 1958, Bogenrief headed the industrial and plant engineering department of the Grayson Controls Division in Long Beach, Calif.

JAMES D. LITTLE, rate accounting supervisor for Ohio Fuel Gas Co., has been promoted to the rate department of the Columbia Gas System Service Corp. in New York.

GEORGE H. BELL, sales representative for Superior Meter Division of Neptune, has been assigned added sales territory in western Pennsylvania and West Virginia. He also covers Ohio, Tennessee, Kentucky, and part of Indiana.

DOUGLAS K. RIDLEY has been named to the post of contract sales manager for automatic control equipment produced by Minneapolis-Honeywell's Brown Instrument Division and other Industrial Products Group units.

Lone Star Gas Co., Dallas, has named HOYT E. WILKINSON regional accountant for the south Texas region of distribution. He replaces JOHN O. ANSELIN, recently named manager of customer accounting for the company.

LEONARD ROACH has been named residential heating and air conditioning representative in the Corpus Christi area by Houston Natural Gas Corp.

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LOWELL V. REED has been named director of the Columbia Gas System's new customer service training center. He has been customer service manager for Manufacturers Light & Heat Co., conducting a service training program at Washington, Pa. Now he will standardize the training of all Columbia service personnel who come in contact with customers.

DEWITT C. MACKENZIE is director of purchasing for the East Ohio Gas Co., Cleveland. A graduate of the U. S. Naval Academy, MacKenzie retired with the rank of rear admiral after 26 years' active duty with the Navy. In his new post, he will direct overall purchasing policy and inventory control for East Ohio.

Five appointments have been made in Michigan Consolidated Gas Co.'s sales department. ANDREW J. VANHOEF, a 25-year veteran with the Detroit company, is industrial engineer. He succeeds C. B. KIEHLE, who retired recently. GEORGE E. MARBLE is assistant industrial engineer. H. JEROME SEITZ has been named superintendent of sales training and promotion and DONALD J. GALLOWAY is dealer coordinator superintendent.

IRA J. RAPSON has been named manager of marketing research for Michigan Consolidated Gas Co., Detroit. WILBUR H. GLINES succeeds him as Detroit district sales manager. Also, MILTON W. ELERT has been named assistant district sales manager.

LORIN LEPLEY is Galion local manager for Ohio Fuel Gas Co. He formerly was district plant engineer at Elyria.

ROBERT D. SPRIGGS has been named director of industrial relations by Robertshaw-Fulton Controls Co., Richmond, Va.

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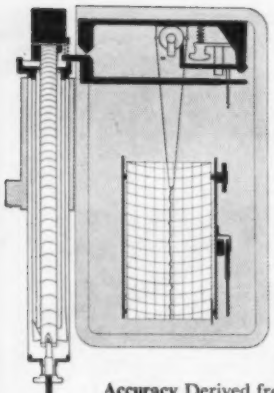

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JACK D. SPARKS, who started out in 1940 as a laborer in Whirlpool Corp.'s wringer washer plant, has been named vice president for RCA Whirlpool appliance sales. He succeeds JOHN A. HURLEY, who is reducing his work load because of illness. Hurley will become special assistant to board chairman Elisha Gray II.

WILLIAM THOMAS, JR., has been named manager of the west central division for the utility department of Borg-Warner Corp.'s Norge division. His territory is made up of Colorado, Wyoming, Nebraska, Kansas, Oklahoma, and western Missouri. Thomas formerly was sales manager of Greeley Gas Co.

CHARLES G. SIMPSON, general manager of Philadelphia Gas Works, is general chairman of the 1960 membership enrollment of the Philadelphia Fellowship Commission . . . ROBERT L. GAGE, manager of Michigan Consolidated's industry development division, is president of the Detroit Area Economic Forum . . . Dresser-Ideco Co., Columbus, has named JOHN L. PAUSCH to chairman and HENRY KNIPPENBERG as president and general manager . . . RAY HILL is district sales representative in Oklahoma and Kansas for Magic Chef . . . RICHARD M. NORTON has taken on the newly created post of national sales manager of Raypak Co., Inc., El Monte, Calif.

Deaths

CLIFFORD JOHNSTONE, who retired in 1956 after more than 30 years of service with the Pacific Coast Gas Association, died late in December. Born in Canada, Mr. Johnstone was an Army pilot during World War I. Following the war, he became a member of the engineering staff of what was then the California Railroad Commission, now the California Public Utilities Commission. As gas engineer for the commission, he demonstrated his talents so clearly he became the unanimous choice of the 1924 PCGA committee charged with selecting a full-time manager, the post he held until his retirement.

P. E. BECKMAN, vice president in charge of gas operations for Pacific Gas & Electric Co., San Francisco, died recently. He joined PG&E in 1921 in the gas construction department.

Washington • *Cont'd.*

from page 17

If there is still any tendency for gas industry executives, particularly the distributors, to underestimate this drive, it will be wiped away before the end of this year.

Public relations planning by the coal group is a combination of "being ready to meet any attack" on their national fuels policy drive, and a long-range program of "coal education." Booklets and films are being distributed to schools and colleges, ostensibly acquainting students with the career opportunities in coal mining and utilization engineering.

It's going to be a tough fight for the gas industry.

BEFORE the end of the year, the Federal Power Commission and other regulatory agencies of the federal government may be operating under stiff new rules of conduct laid down by Congress.

Most of the heat for a clean-up measure to clamp strict operating controls over regulatory agencies is aimed at the Federal Communications Commission, the Civil Aeronautics Board, and the Federal Trade Commission.

Rep. Harris is concentrating on drafting some type of legislation to strictly control so-called *ex parte* communications. This is where only one side in a proceeding comes in contact with an agency, an official, or some other legal body.

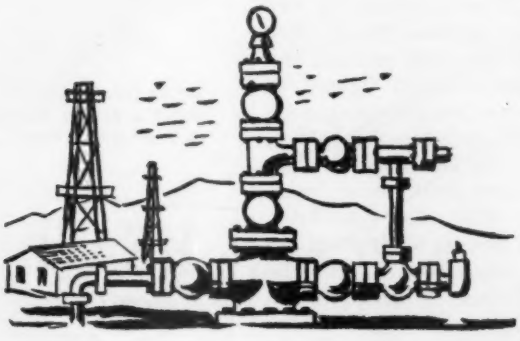
Ex parte communication "is resorted to in efforts to bring unwarranted pressure to bear on those who make the decisions and it is susceptible of use in the exercise of undue and culpable influence," Rep. Harris says. But he also admits that the channels of communication must be kept open so that officials of these agencies can get all the information they need.

The measure under study by the Harris group was drafted with the help of the American Bar Association. It would outlaw deliberate contacts with members of these boards on behalf of any one party once a contested case is set for hearings. It would require also that a summary of any oral communications about the case be made public.

FPC Chairman Jerome Kuykendall has proposed instead that Congress not outlaw *ex parte* communication, but permit it if the communications are in writing and require that they be put in the public files. He would completely prohibit oral *ex parte* communication in a contested case. He, and other agency heads, have sharply opposed the proposal to require an official to make a public "true summary" of any oral contacts made on behalf of an applicant.

Ex parte communication, however, is not the only problem of the regulatory agencies which Congress will look into this year. These agencies were created to administer the problems caused as the government has become more and more the boss of the economic system. But they've created as many problems as they solved.

For one thing, the agencies have become embroiled in a detailed



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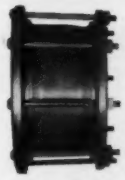

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legal procedural system to the point where it often takes years for a decision, which then is often reviewed by the courts in another lengthy proceeding. Some method of forcing a speed-up in the process will probably be considered.

Another frequent criticism which Congress will undoubtedly study this year is that the agencies are so specialized that they consider only a single section of the total economic picture. Among other things, this produces a tendency by the agency to seek more and more control powers over matters that should be left to free competition to decide, and a reluctance to apply anti-trust principles to its decisions.

The anti-trust angle was recently illustrated in the division between the FPC and the Justice Department over the merger of El Paso Natural Gas Co. and the Pacific Northwest Pipeline Corp. Regulation and competition as economic principles have always clashed, but in this case they brought sharp disagreement between the two government agencies.

The Justice Department has been opposing the merger in the courts, and the FPC after hearing the evidence approves the merger. The Justice Department court attempt to block the merger came first, but was then held up while the FPC study was underway. Antitrust officials said after the FPC approval of the merger that they will pursue their court efforts to block it. It appears that the question will eventually be settled by the U. S. Supreme Court.

Justice Department lawyers and the FPC and other regulatory agencies have long been at odds over who has anti-trust authority over regulated industries where the laws creating the agencies do not spell it out. The principal problem created by the drive to tighten up laws governing regulatory agencies is the public reaction that will be generated. The new laws, in whatever form they finally come, won't materially affect the industries. But in the process of drafting the laws and uncovering a few misdeeds, the image of industries and firms "trying to pull fast tricks" to gouge consumers will again be created. ■

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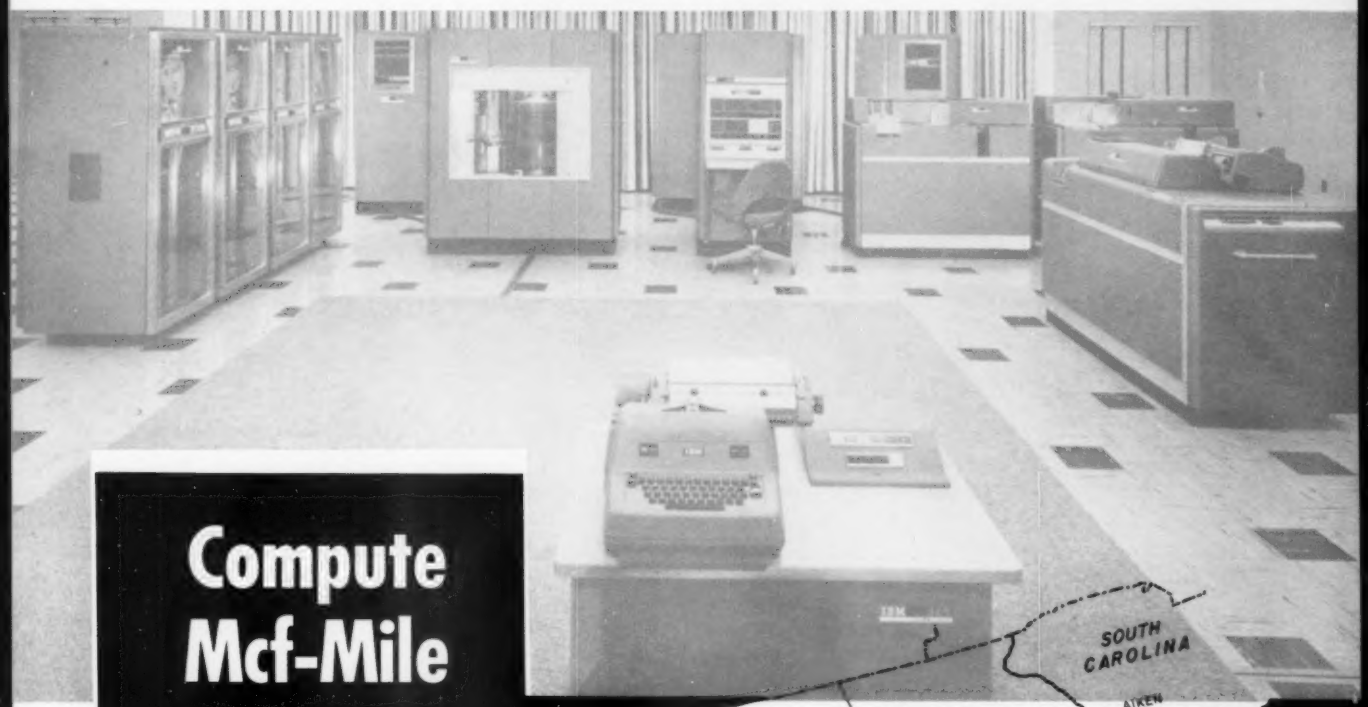
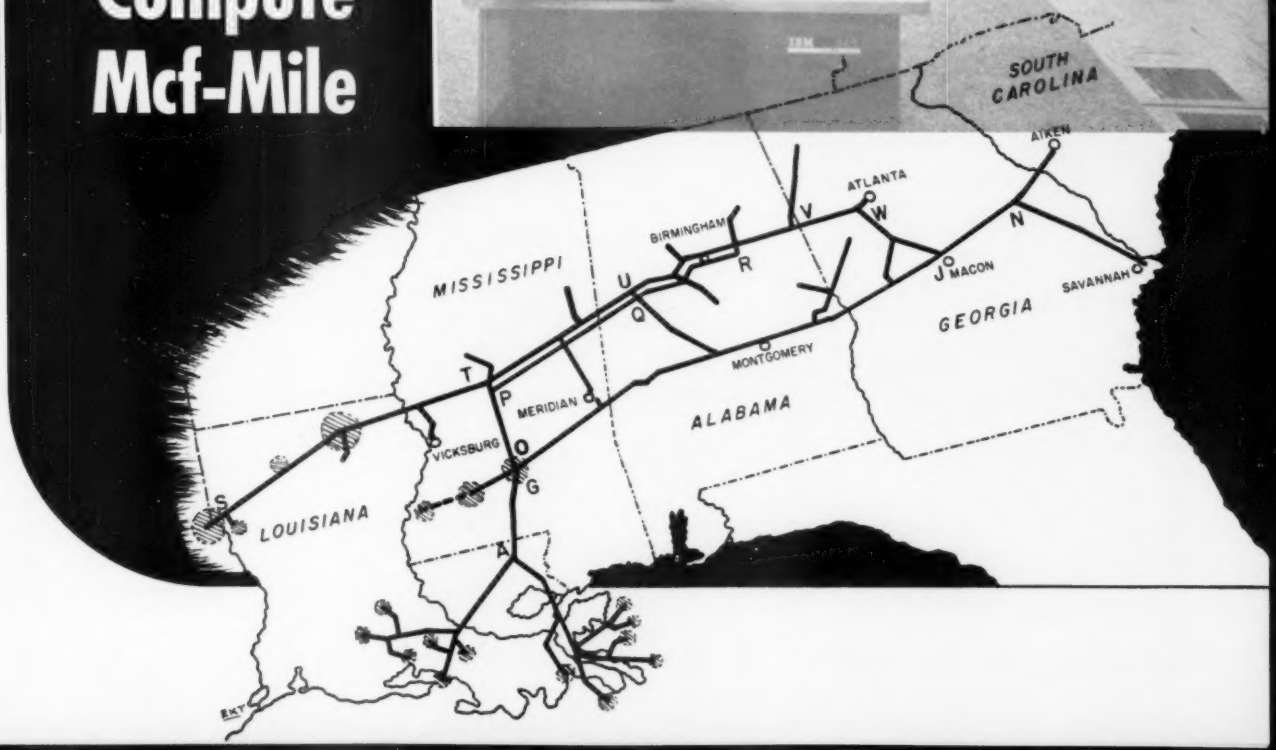
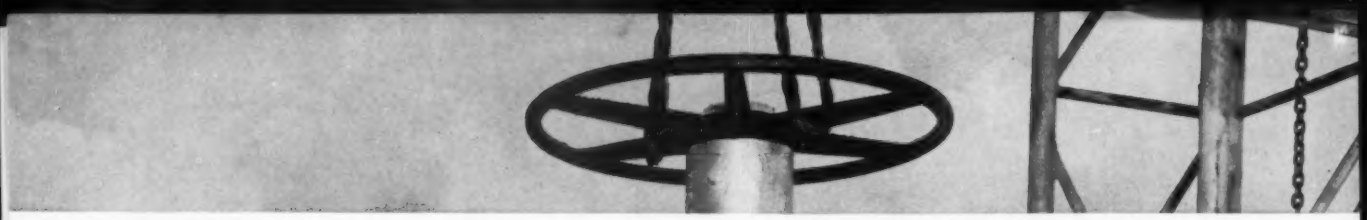


Compute Mcf-Mile





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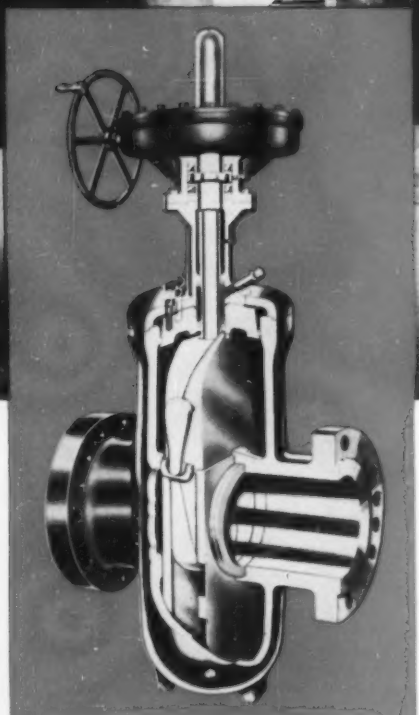

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Digital computer applied to

MCF-MILE STUDY

By F. M. JESSUP, Planning Engineer
and ROY ADAMS, Applied Science Engineer
Southern Natural Gas Co., Birmingham

SOUTHERN NATURAL GAS CO.'s transmission system consists of two multiple-piped mainlines about 70 miles apart, paralleling each other for about 330 miles. Each line receives its supply from different areas. Delivery is effected through a somewhat intricate system of branch lines supplied from either mainline. In addition to the functional connections at points of supply and delivery, the lines are interconnected at intervals, forming a number of strategic loops that have to be precalculated for balance. All values, such as volume and pressure, are mechanically controlled through regulators at such interconnections as demanded by operating conditions. The complexity of the problem is increased by the fact that many of the delivery points may be served partially or wholly from either line or area.

The problems facing operating and planning engineers are essentially these: Under actual or proposed operating conditions, from which source, along which lines, and over how many miles is each delivery being serviced? The prime question is: What is the average number of miles for each Mcf of gas transported from supply to delivery? This information is used in general in establishing cost of service by rate zones for transmission companies and is essential for use in Federal Power Commission rate cases.

First this job was adapted to a desk calculator with the solutions for a single operating condition requiring about 40 hours of tedious calculations by a well-trained engineer. As the system, and hence the problem, grew more complex, the job was applied to the IBM 604 calculator. This approach required about five hours of machine calculations by a skillful operator adept at handling punched cards, plus a varying amount of time for review by the engineers. Results proved reliable and time was not too excessive. The most undesirable feature of the 604 attack was the incessant rearrangement and re-running of the deck of punched cards.

Southern Natural has now programmed this Mcf mile project for the IBM 650 digital computer. One complete set of calculations can be compiled within 18 minutes. This program affords, through the 650, a direct, efficient, and accurate approach to this problem. The internal speed of the 650 plays an important role in collapsing time to a minimum. But perhaps the most important single facility employed is the internal storage available through the magnetic drum of the computer. This storage allows for complete consideration of groups of values which are inter-

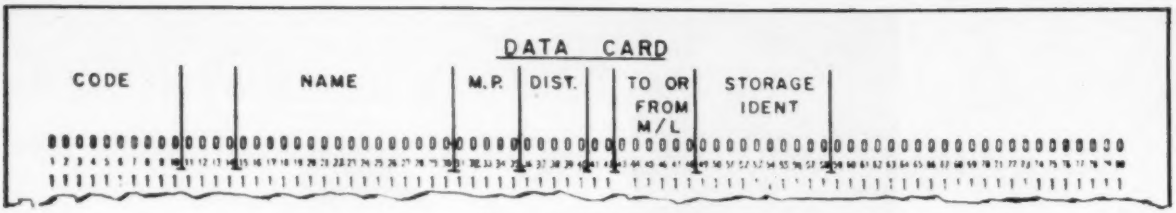


Fig. 1. Sample data card.

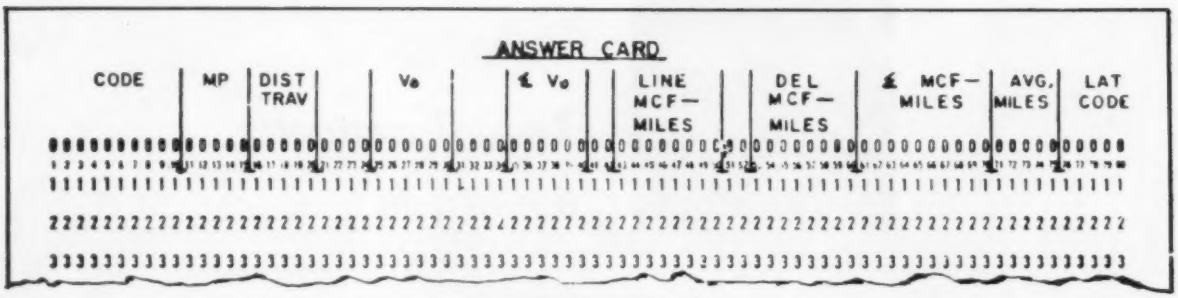


Fig. 2. Sample answer card.

related, as opposed to partial treatment and then assembly of partial answers inherent in each of the previous methods outlined. The end result is that calculations are completed by the computer as the data are fed through in one run of a single deck of IBM punched cards.

Generally speaking, the arithmetic is quite simple but voluminous. Decisions needed for determining relationships of conditions, lines, and deliveries are considerably more complex and equally voluminous. A given volume flowing along the line acquires Mcf-miles through multiplication of that volume times the number of miles traveled. As volume is entered into the line, that volume and its Mcf-mile value are added to the accumulated volume and accumulated Mcf-miles values. From these, through a process of division, the average miles per unit volume is determined. As a volume is delivered, that volume is multiplied by the average mile value. There the resultant product is subtracted from the flowing Mcf-mile value while the delivered volume is subtracted from the flowing volume at that point. The following formulas show the basic arithmetic involved in the study.

Formula I—

Line Volume (ΣV_o) = ΣV_o * Spot V_o

Formula II—

Del. or Spot Mcf-Mi. = Spot $V_o \times$ Avg. Mi.

Formula III—

Line Mcf-Mi. = $\Sigma V_o \times$ Geo. Mileage traveled

Formula IV—

Avg. Miles = Σ Mcf-Mi. $+ \Sigma V$

In preparation of the problem for the IBM 650, it is necessary to record in punched card form the basic data for each point to be considered along the pipeline such as supply points, delivery points, junctions of lines or regulators. This data card will show:

1. An identification code unique for that point, and its mile post position.
2. The popular name of the point on the line.
3. The distance from the point immediately preceding it.
4. The volume of gas entered or delivered at that point.
5. A special coded indicator to label the point as source, delivery, interconnection, junction, or similar designation as needed.

This set of data cards is read by the computer to furnish volumes and distances for calculation. *Fig. 1* shows a sample data card. After calculations have been completed, this same set of data cards is employed with the answer cards, affording for the print out the popular name at each point for which calculations were made. *Fig. 2* shows a sample answer card.

The interconnections among lines, noted above, are synonymous to storage points along the line. The volume for such storage points is predetermined and is punched in the basic data as delivery volumes. No effort need be expended for re-entry since storage is picked up automatically. The program treats the system automatically as it proceeds along the pipeline punching one set of answers for each data point.

The storage drum of the IBM 650 has 2000 locations, labeled 0000 to 1999. The program employs locations 0000-0799 of this storage. Locations 0800-1999 are reserved for data, allowing each closely related set of points, such as those making up a lateral system to contain up to 150 points. Eight words are necessary to store basic data and answers for each point. Provisions have been made for the storage of eight delivery points and the calculations of laterals up to the third degree. More storage areas and higher

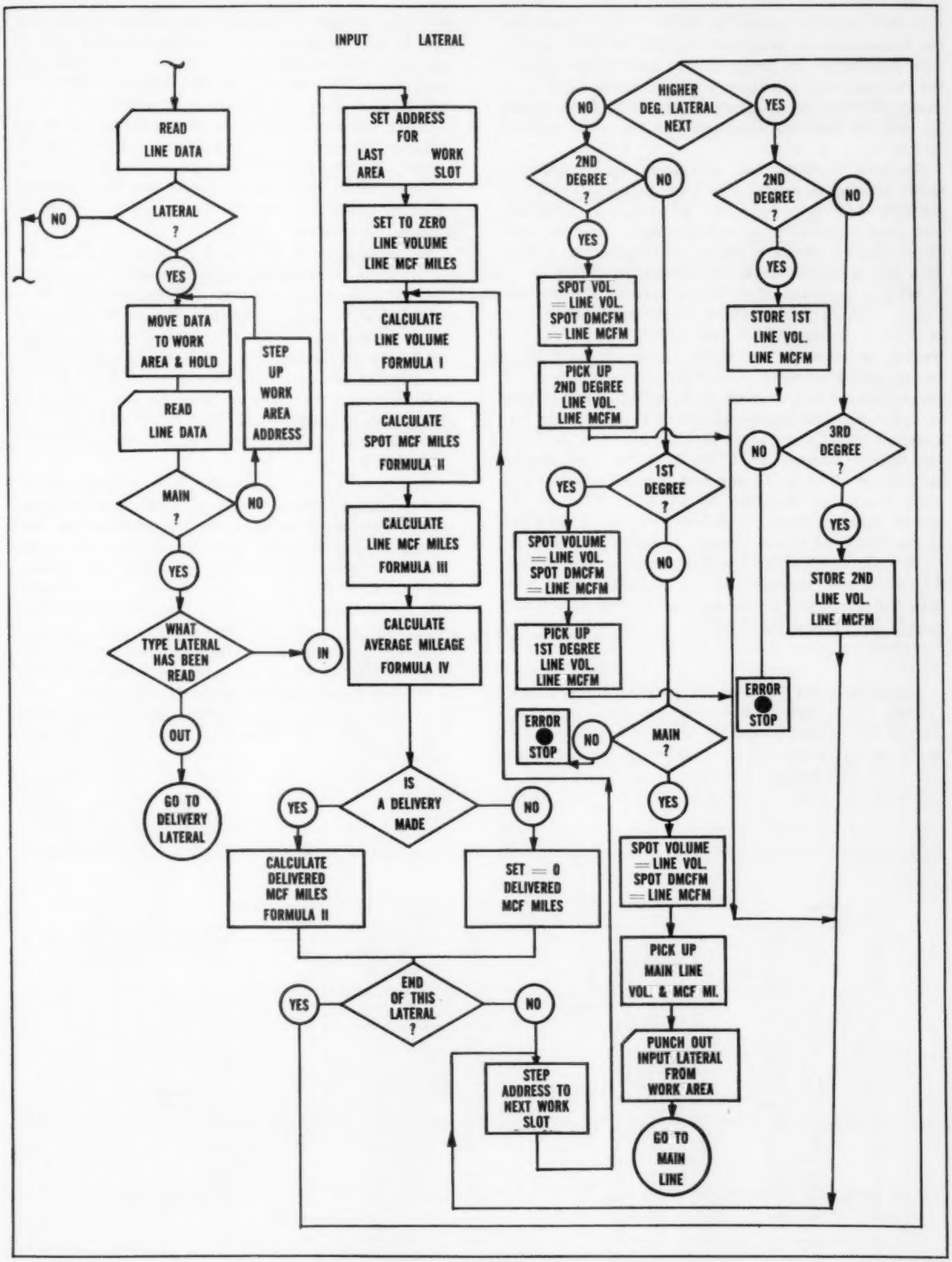


Fig. 3. Procedure flow chart for input lateral.

degree laterals may be accomplished at the expense of the number of points allowed on a lateral system.

A flow chart is shown as *Fig. 3*. This chart was the initial step in programming the Mcf-Mile study. This portion of the program was used to accumulate the volume and calculate an input lateral. *Fig. 4* shows the written program in symbolic form (Soap II) and in machine language for the same section as *Fig. 3*.

Southern Natural has a system which requires about 1000 data cards. The total 800-word program for this study required about 187 hours of programmer time and 100 hours of engineer's time to complete. *Fig. 5* shows a layout of Southern's system with flow generally from AGJN, OPQR, STUVW.

A block diagram of a simple system is shown as *Fig. 6*. Calculations involved in this study are shown as *Fig. 7*. Lines AGJN and OPQR and Q_1TU are treated as separate mainlines inasmuch as storage inputs cannot be accomplished on a branch line. A 1st degree lateral is exampled by lines $B'C_1$; 2nd degree by line $C'F_2$; 3rd degree by line $D'E_3$. A lateral line introduction is recognized by X's in CC-4 & 7 for 1st degree laterals or CC-7 & 9 for 2nd degree laterals or CC-9 & 10 for 3rd degree laterals. An input lateral is identified by an X in CC-1 of the lateral introduction card followed by an X in CC-1 of the first card of the lateral. A delivery lateral has an X only in CC-1 of the first card of the lateral. Any system of laterals ($B'C_1$, $C'F_2$, $D'E_3$) may have both deliveries and inputs but the system as a whole has to be predesignated. Each junction of lines is described by three points such as B, B′, B″, and G, G′, G″.

Assuming point "A" as the origin of the overall system, the program will read in data card "A," storing the volume picked up from that gas field and punching out answer card A showing the identification code, the volume picked up and the mileage if any with zero Mcf miles, zero delivery Mcf miles, zero accumulated Mcf miles and zero average miles. Data card B is next read bringing in mileage AB with zero volume for point B and indicating the next card B′ will be on a lateral system. Answer card B will show the identification code for B, mileage AB, spot volume accumulated in the lateral system, accumulated volume in mainline just previous to point B input, product of this mainline volume times the distance AB and the accumulation of such products to point B. This information will not be punched out, however, until the lateral system has been investigated to determine the volume and Mcf-miles to be put into the system.

The program will then read cards B′, C, C′, D, D′, E_3, D″, F_2, C″, C_1, and B″ and store each into memory. Card B″ indicates by its return to the mainline (x in CC-4) that the lateral system has been completely stored. Calculations for the lateral are then made and stored proceeding from C_1 to C″ and followed by the other in reverse order since it is an input lateral. Answer card B will then be punched out followed by the answer cards B′, C, C′, etc. Answer card B″ will show the results of the mainline AB and the lateral system B-B″.

Data card G is next read and the cumulated volume, Mcf-miles and average miles are calculated for that point. This card being a lateral introduction card cannot be punched out until the volume to be delivered or picked up on the lateral is determined. Card G′ identifies the type of lateral. The program next reads and stores the lateral system into memory until a return to the mainline is indicated. The total volume to be delivered, having been cumulated at this point, is multiplied by the average miles at Card G to develop a delivered Mcf-miles at that point. Card G is then punched out followed by Card G′ which uses the delivered volume and delivered Mcf-miles from Card G as flowing volume and accumulated Mcf-miles respectively. Each lateral card is then calculated and punched out delivering volume and accumulating

CARD NO.	SYMBOLIC INSTRUCTION			MACHINE LANGUAGE INSTRUCTION				COMMENTS
65		RCD	I0001	0066 70 0001	0101			READ NEXT
66		LDD	I0010	0101 69 0010	0113			CARD TEST
67		BD2	LAT1	0113 92 0060	0018			FOR
68		RAL	I0004 LOOP	0018 65 0004	0054			JUNCTION
69	LAT1	STD	W0008	0116 24 0807	0210			MOVE DATA
70		LDD	I0001 STO1	0210 69 0001	0304			TO WORK
71	STO1	STD	W0001	0304 24 0800	0053			AREA FOR
72		RAL	I0002	0053 65 0002	0357			LATERALS
73				0357 35 0005	0069			
74		ALO	I0003 STO2	0069 15 0003	0407			
75	STO2	STL	W0002	0407 20 0801	0354			
76		LDD	I0004 STO3	0354 69 0004	0457			
77	STO3	STD	W0003	0457 24 0802	0305			
78		RCD	I0001	0305 70 0001	0151			READ CARD
79		LDD	I0010	0151 69 0010	0163			ON LATERAL
80		BD1	MAINP	0163 91 0166	0068			
81		RAL	STO1	0068 65 0304	0159			
82		ALO	CON8	0159 15 0000	0355			STEP MOVE
83		STL	STO1	0355 20 0304	0507			ADDRESSES
84		ALO	CON1	0507 15 0150	0405			TO STORE
85		LDD	STO2	0405 69 0407	0260			LATERALS
86		SDA	STO2	0260 22 0407	0310			IN WORK
87		ALO	CON1	0310 15 0150	0455			AREA
88		LDD	STO3	0455 69 0457	0360			
89		SDA	STO3	0360 22 0457	0410			
90		ALO	CON5	0410 15 0050	0017			
91		LDD	LAT1	0017 69 0116	0119			
92		SDA	LAT1	0119 22 0116	0169			
93		LDD	I0010 LAT1	0169 69 0010	0116			

CARD NO.	SYMBOLIC INSTRUCTION			MACHINE LANGUAGE INSTRUCTION				COMMENTS
465	ENDIT	RAL	TEST2	0419 65 0104	0670			TEST DEGREE
466		LDD	DEGT	0670 69 0720	0476			OF NEXT LATERAL
467		SDA	DEGT	DEGT 0476 22 0720	0723			
468		RAL	CON1	0723 65 0150	0720			
469	DEGT	LDD		0720 69 0000	0770			
470		BD1	SHIF1	MAYB 0770 91 0773	0575			
471	MAYB1	BD2	SHIF2	MAYB 0575 92 0128	0280			
472	MAYB2	BD3	SHIF3	MAYB 0280 93 0483	0285			
473	MAYB3	BD4	SHIF4	SEAC 0285 94 0038	0040			
474	SHIF1	SRT	0003	MAYB 0773 30 0003	0575			
475	SHIF2	SRT	0002	MAYB 0128 30 0003	0280			
476	SHIF3	SRT	0003	MAYB 0483 30 0003	0285			
477	SHIF4	SRT	0003	SEAC 0038 30 0003	0040			
478	SEAC	NZE	ISHI	ISLO 0040 45 0094	0195			
479	ISHI	BD3	ISSEC	0094 93 0047	0299			HIGHER DEGREE
480		BD4	ISTRD	0299 94 0102	0571			LATERALS
481		HLT	5555	ISSE 0571 01	5555	0047		
482	ISSEC	LDD	SIGV0	0047 69 0013	0621			SECOND DEGREE
483		STD	KP1ST	0621 24 0122	0625			LATERAL STARTING
484		LDD	SIGMC	0625 69 0045	0349			
485		STD	KP1S	0349 24 0201	0671			
486		LDD	DMCFM	0671 69 0052	0721			
487		STD	KP1D	NLAT 0721 24 0172	0146			
488	ISTRD	LDD	SIGV0	0102 69 0013	0771			THIRD DEGREE
489		STD	KP2ND	0771 24 0222	0675			LATERAL STARTING
490		LDD	SIGMC	0675 69 0045	0399			
491		STD	KP2S	0399 24 0251	0322			
492		LDD	DMCFM	0322 69 0052	0372			
493		STD	KP2D	NLAT 0372 24 0272	0146			

Fig. 4. Written program in symbolic form and in machine language for the same section as shown in Fig. 3.

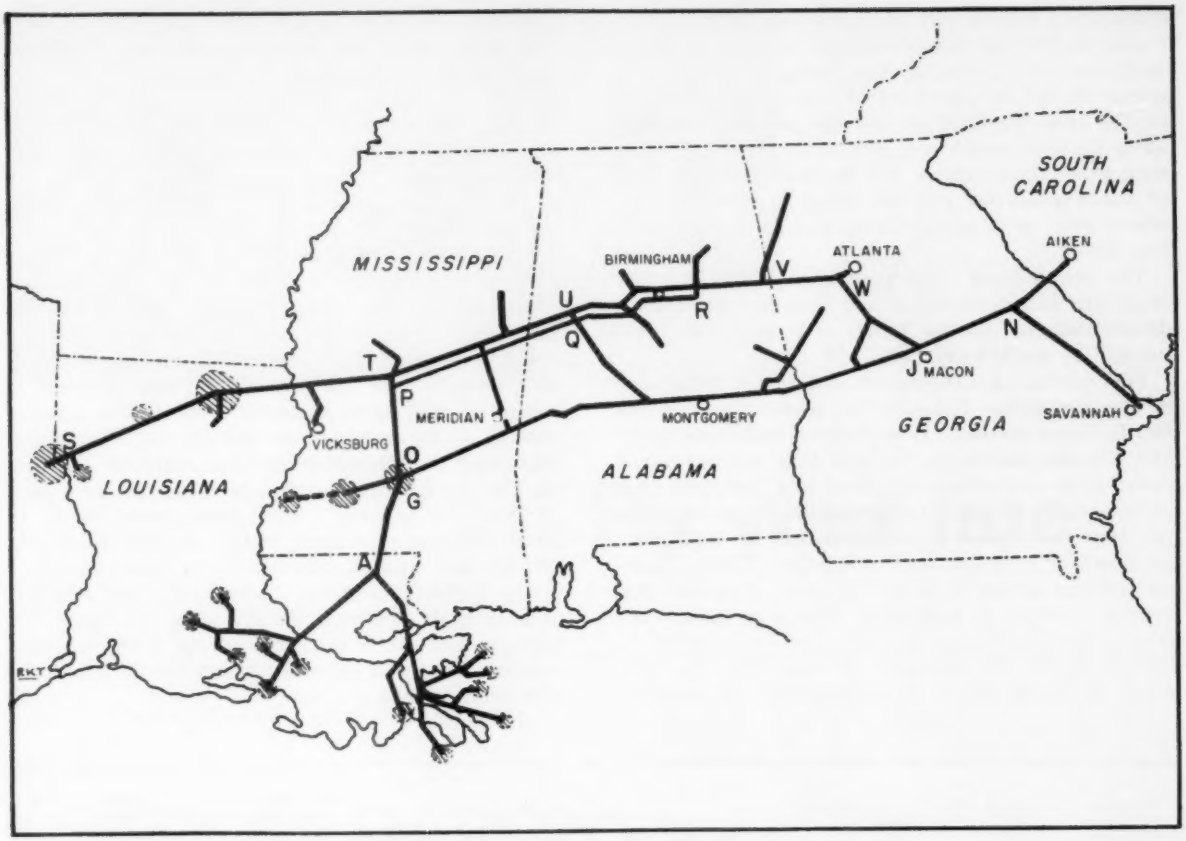


Fig. 5. Layout of Southern Natural system.

Mcf-miles as it flows in the lateral the same as mainline calculations. A higher degree delivery lateral is treated the same as a first degree lateral with the accumulation of volume and punching out of cards as they are calculated.

Card J storage is different from other deliveries inasmuch as the delivered volume and Mcf-miles have to be stored and picked up as an input card on line Q_1 TU.

At the end of line AGN and all other mainlines there will be zero volume and accumulated Mcf-miles after the last delivery. Point O will be shown as an input to a mainline with zero volume and accumulated Mcf-miles. Card Q will deliver a volume and Mcf-

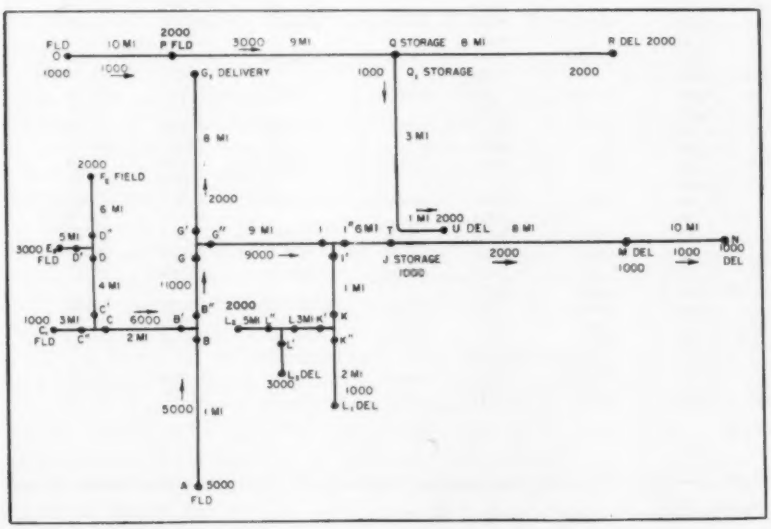


Fig. 6. Block diagram of a simple system.

miles figure into storage to be picked up by line Q_1TU.

Line Q_1TU will begin with an input from stored Mcf-miles and Volume Q. The average miles of transportation will be calculated at this point which will be the same as Card Q. As the program proceeds along the line, card T will be read as an input volume with accumulated volume and Mcf-mile addition. Both of these quantities will be picked up from storage where they were placed in calculating J storage in line AGJN.

The only manual steps remaining in the Mcf-mile study are data preparation and storage point volume determinations. In the future it is felt that these too will be mechanized.

This method of computation is different from some of the approaches following the general idea of the Hardy Cross method. It is shorter and more direct and is made possible by the fact that volumes on all closed loops are set by regulators and therefore need no balancing. Without such regulating controls, it is felt that the approach outlined would be difficult to program for a medium scale computer. Within transmission companies, however, regulated pressures and volumes seem to be prevalent. This is in direct contrast to distribution systems where closed loops without regulators are common. Consequently, the program as it now stands is designed for transmission systems with relatively few closed loops having regulators. For such systems it affords fast computing and simplicity of use and preparation.

Southern has now completed a companion program for the IBM 650 for flow pattern calculations, using the same logic approach for an identical system of regulated loops. It holds great promise for the calculation of pressure-volume relationships in a minimum of time.

Study is being directed toward having the IBM 650 compile delivery volume directly from sales information which is already on punched cards. Following that step, attention will be focused on computing supply volumes through economic factors and contract requirements. As the present Mcf-mile program is refined to give more available space in the internal storage of the computer, or with the use of magnetic tape input for the computer, it is definitely felt that all line storage volumes will be computed as a part of the main program. With these modifications in mind, complete automation of both the Mcf-mile study and the flow pattern calculations are foreseen.

The Mcf-mile program is now in use and is available through Southern Natural Gas. It serves its purpose well. It is not proposed as a blanket type solution, but could be readily adaptable to transmission companies in general. ■

	CODE NO.	MP	DISTANCE	SPOT VOL. INP OR DEL.	VOLUME	LINE MCF-MILES	DELIVERY OR INPUT MCF MILES	MCF MILES	AVG. MILES TRAVELED
PNT A INPUT	1000x000000	0.00	0.00	5000	5000	-	-	-	0.00
PNT B TAP	1x001x000x000	1.00	1.00	(6000)*	5000	5000	62000	5000	1.00
PNT B' TAP	1x001001x000	0.00	2.00		6000	12000		62000	10.33
PNT C TAP	1x001002x00x0	2.00	0.00	(5000)	6000	-	47000	50000	8.33
PNT C' TAP	1x00100201x0	0.00	4.00		5000	20000	-	47000	9.40
PNT D TAP	1x00100202x0x	4.00	0.00	(3000)	5000	-	15000	27000	5.40
PNT D' TAP	1x001002021x	0.00	5.00		3000	15000	-	15000	5.00
PNT E_3 FIELD INPUT	100100202x	5.00	0.00	3000	3000	-	-	-	-
PNT D" TAP	100100003x0	4.00	6.00		2000	12000	-	12000	6.00
PNT F FIELD INPUT	10010000lx0	10.00	0.00	2000	2000	-	-	-	-
PNT C" TAP	1001003x000	2.00	3.00		1000	3000	-	3000	3.00
PNT C_1 FIELD INPUT	100100lx000	5.00	0.00	1000	1000	-	-	-	-
PNT B" TAP	1002x000000	1.00	0.00		11000	-	-	67000	6.09
PNT G TAP	1003x000x000	8.00	7.00	(2000)	11000	77000	26180	144000	13.09
PNT G' TAP	1x003001x000	0.00	0.00		2000			26180	13.09
PNT G_1 DELIVERY	1003002x000	8.00	8.00	2000	2000	16000	42180	42180	21.09
PNT G" TAP	100lx000000	8.00	0.00		9000	-	-	117820	13.09
PNT I TAP	1005x000x000	17.00	9.00	(6000)	9000	81000	132540	198820	22.09
PNT I' TAP	1x005001x000	0.00	0.00		6000			132540	22.09
PNT K TAP	1005002x00x0	1.00	1.00	(5000)	6000	6000	115450	138540	23.09
PNT K' TAP	1x00500201x0	2.00	0.00		5000			115450	23.09
PNT L TAP	100500202x0x	3.00	3.00	(3000)	5000	15000	78270	130450	26.09
PNT L' TAP	1x005002021x	0.00	0.00		3000			78270	26.09
PNT L_3 DELIVERY	1005002022x	4.00	4.00	3000	3000	12000	90270	90270	30.09
PNT L" TAP	100500203x0	3.00	0.00		2000			52180	26.09
PNT L_2 DELIVERY	10050020lx0	8.00	5.00	2000	2000	10000	62180	62180	31.09
PNT K" TAP	1005003x000	1.00	0.00		1000			23090	23.09
PNT L_1 DELIVERY	100500lx000	3.00	2.00	1000	1000	2000	25090	25090	25.09
PNT I" TAP	1006x000000	17.00	0.00		3000			66280	22.09
PNT J_1 STORAGE	1007x000000	23.00	6.00	1000	3000	18000	28090	84280	28.09
PNT M DELIVERY	1009x000000	31.00	8.00	1000	2000	16000	36090	72190	36.09
PNT N DELIVERY	1001x000000	41.00	10.00	1000	1000	10000	46100	46100	46.10
PNT O INPUT	2000x000000	0.00	0.00	1000	1000	-	-	-	-
PNT P INPUT	2001x000000	10.00	10.00	2000	1000	10000	-	10000	10.00
PNT Q STORAGE	2002x000000	19.00	9.00	1000	3000	27000	12330	37000	12.33
PNT R DELIVERY	2004x000000	27.00	8.00	2000	2000	16000	40670	40670	20.33
PNT Q_1 STORAGE INPUT	3000x000000	0.00	0.00	(1000)	1000	-	12330	-	-
PNT J_1 STORAGE INPUT	3002x000000	3.00	3.00	(1000)	1000	3000	28090	15330	15.33
PNT U DELIVERY	3003x000000	4.00	1.00	2000	2000	2000	45420	45420	27.71

*Parenthesis indicate machine summation

Fig. 7. Calculations involved in study of Fig. 6.

PG&E finds it pays to

Fly your line

By RALPH S. NABORS
Pipeline Operations Department
Pacific Gas & Electric Co.
Bakersfield, Calif.

GAS transmission mains, operated and maintained by Pacific Gas & Electric Co.'s pipe line operations, consist of approximately 1600 miles of lines. The geographical area in which mains are installed reaches from the California-Arizona line at Topock, to Milpitas and Antioch in the San Francisco Bay area. The 34-in. mains extend from Topock to Milpitas, a distance of 500 miles. Other mains, originating in the Kettleman Hills area extend to Milpitas and Antioch. Telephone circuits are installed along all major mains. Radio installations provide communication to all areas.

These lines traverse desert, mountain, extensively cultivated areas and built-up residential areas. The problems of patrolling in the types of terrain traversed are many.

The desert area patrol roads are not without problems. While right to install and maintain roads along the line is a simple matter, the difficulty and cost of maintenance is a factor. During the summer months, flash floods cause extensive damage to sections of the road. Roadways across deep washes are vulnerable to the effects of erosion from severe storms. The roads through soft sandy areas are difficult to maintain in a condition that allows free access to the line. The cost of establishing roads through lava flows is considerable.

In the mountain areas the problem of constructing and maintaining patrol roads is a more complicated matter. Winter rains and snow frequently make these roads impassable. Grades are such that four wheel drive equipment is required to negotiate some of the more severe slopes. Roads frequently require switchbacks to reduce grades.

In the area through the San Joaquin valley the establishment and maintenance of roads is impossible without acquisition of exclusive rights to use the land. This problem has become increasingly difficult with more and more of the marginal valley land being developed for irrigated farming operations.

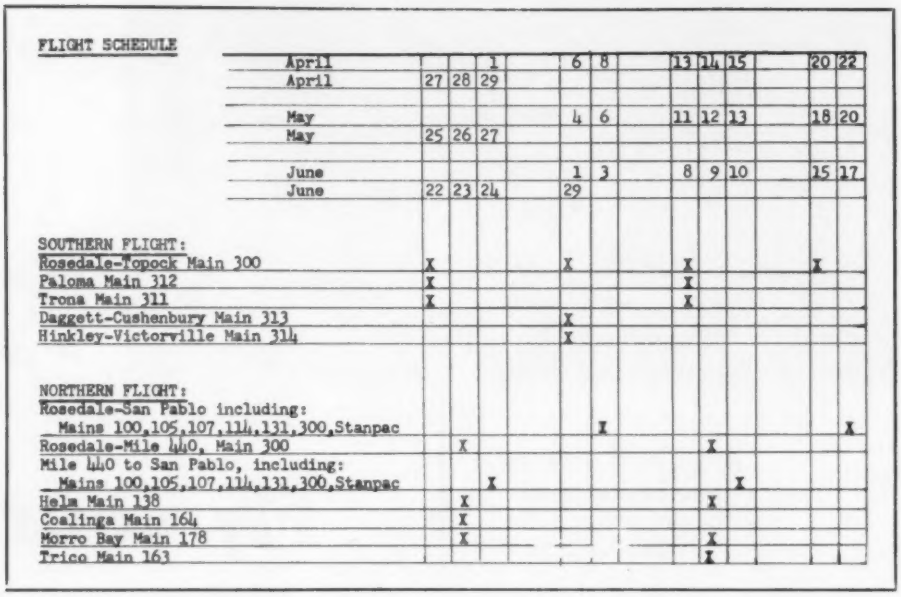
• Patrol practice

It has been our practice to patrol, on a regular schedule, our major gas transmission mains. From years of experience the frequency of patrol had been established as follows:

Car patrol—on a weekly schedule
Foot patrol—on a monthly schedule

Patrols are performed to determine:

1. The general condition of the main right-of-way.
2. Evidence of sunken trenches.
3. Water erosion and land slide areas.
4. Land leveling or grading activities.
5. Irrigation and drainage canal construction.
6. Installation of irrigation piping system, sewer and other underground pipeline activity.
7. Prospector mining on or near the right-of-way.
8. Quarry and blasting work.
9. Seismic geological survey activities.
10. Well drilling activity.
11. Building activity which may affect right-of-way.
12. Leaks in mains.
13. Damage to telephone circuits.



FLIGHT SCHEDULE

	April		1		6	8		13	14	15		20	22
	April	27	28	29									
	May				4	6		11	12	13		18	20
	May	25	26	27									
	June				1	3		8	9	10		15	17
	June	22	23	24	29								
SOUTHERN FLIGHT:													
Rosedale-Topock Main 300		X			X			X				X	
Paloma Main 312		X						X					
Trona Main 311		X						X					
Daggett-Cushenbury Main 313					X								
Hinkley-Victorville Main 314					X								
NORTHERN FLIGHT:													
Rosedale-San Pablo including: Mains 100,105,107,114,131,300,Stanpac						X							X
Rosedale-Mile 440, Main 300			X						X				
Mile 440 to San Pablo, including: Mains 100,105,107,114,131,300,Stanpac				X						X			
Helm Main 138			X						X				
Coalinga Main 164			X										
Morro Bay Main 178			X						X				
Trico Main 163									X				

Fig. 1. Aerial patrol flight schedule.

14. Damage to valves, meters and pressure limit station properties.
15. Any unusual conditions which may have an effect on the transmission mains.

By 1954 the extent of our car and foot method of patrolling had become a major item of cost. The pipeline length then approximated 1000 miles. The cost of patrolling for 1954 was $33,000 as detailed in *Table 1*.

For a basis of comparison, the column of costs on the right "1958 costs" is shown. This column represents the cost we would have to pay in 1958 for the same 1000 miles of pipeline coverage. The increase is due to the higher salary schedules and increased cost of transportation.

Faced with an ever increasing cost of patrolling, and decreasing effectiveness, particularly in farming areas, a study was made to determine the feasibility of aerial patrolling the major pipelines between Topock and Milpitas. The study resulted in action to start aerial patrolling and, as the technique was developed, to work toward the elimination of car and foot patrolling.

• Benefits

1. Savings in patrol costs: The study pointed out that an aerial patrol would cost approximately $205 per week as compared to the $375 being spent for car patrol. Work load equivalent to almost three men would be eliminated. This represented a capturable savings because there was substantial justification for additional field personnel.

2. More adequate patrol: More uniform and complete coverage of the pipeline each week would be made. Adequate car patrol had become impossible over approximately 40 per cent of the mains.

3. Closer coordination of personnel during critical periods: During cold weather, closer control could be maintained while the weekly patrol proceeded independently.

4. Flexibility of patrol schedule: There would be periods during the winter when it would be necessary to augment the scheduled weekly patrols. With only car patrol available, we were limited to manpower and equipment, but the aerial coverage could be augmented merely by the payment of an incremental cost.

5. Personnel transportation: The availability of the aircraft for personnel transport would represent an appreciable savings in time and expense.

6. Availability to make special surveys: The plane would be available for special flights to observe for major breaks in the line, to observe the effects of flooded rivers and creeks, and for other emergencies which would present themselves.

The study revealed no disadvantages to the plan.

• Contract

A contract was negotiated with a flying firm for the patrol work. Since there were at least two mains the entire length of the area to be patrolled, a contract based on an hourly cost proved to be more economical than a contract negotiated on a per mile base. Flight patterns were established to minimize double-backs where more than two mains were being patrolled. All time in the air, with very minor exceptions, resulted in line being patrolled. Had only a single line been involved with a resulting "deadhead" back flight the mileage basis probably would have proven more economical.

TABLE 1. PATROL COSTS

	1954 costs Total	—per mile	*Adjusted to 1958 costs* Total	—per mile
Car	$15,000	$15	$18,000	$18
Foot	$18,000	$18	$21,600	$21.60
Total	$33,000		$39,600	

Included in the contract were provisions for transporting materials and personnel, rates for standby time and pay for overnight layover if required.

Aerial patrolling by a contractor seemed to fit our particular needs better than attempting to perform our own patrolling. The advantage of having an experienced aerial contractor, familiar with patrol techniques, appealed to us. We felt that it would aid us appreciably in setting the program into action. Lack of familiarity with our particular lines could be overcome fairly readily.

Our aerial patrol needs would not require full time use of the plane and pilot. With only two or three patrol days per week under consideration, contracting the work had economic advantages when compared to owning and operating aerial patrol service. If our aerial patrol requirement and personnel transportation had amounted to full time utilization of plane and pilot, the economic consideration might have changed our decision to contract this work.

Contracting this work has the following advantages:

1. No capital outlay for planes to put the plan into effect.
2. Contractor's familiarity with CAA regulations.
3. Contractor's responsibility for ship service and checks required by CAA.
4. Contractor would carry his own insurance, indemnifying company.
5. Assurance of reliable pilot observer.

Company-owned aircraft for patrolling appeared to us to have the following disadvantages:

1. Would require an employee pilot with only part-time flying activity.
2. Would involve overtime pay, meal and other penalties imposed by contract, if flight schedule exceeded 8 hours.
3. Would involve unproductive time ferrying aircraft for service and checks.
4. Accident liability could be excessive against a large corporation.
5. Possible unfavorable public reaction to low flying company plane.
6. Relief for pilot would be required to afford vacation and sickness relief.

• Patrol frequency

The next step was the determination of which mains were to be patrolled and the desirable frequency of patrolling.

It was decided that patrol frequency would be determined on the basis of the necessity that any particular line had to continuance of service. The important 34-in. mains, capable of transporting about 60 per cent of our total load requirement, were, of course, considered in the first category of importance. Some other mains, although transporting much less gas, were deemed as eligible for weekly patrols because of these particular lines' importance to given load areas. The mains were therefore classified into three groupings:

WEEKLY

1. Important cross country mains.
2. Mains which were important because of service to certain load areas.

BI-WEEKLY

1. Mains subjected to high pressure (600 lb or more) in the desert areas which were the sole supply to a geographical area.
2. Mains to important service areas but reinforced with alternate means of supply for short periods.

MONTHLY

1. Gas field collection mains and lines not included in the two former categories.

This report confirms the verbal report transmitted to Division Headquarters on day of patrol. Do not duplicate investigation.

MAIN NO.	LOCATION (MILE)	OBSERVATIONS	FINDINGS OR ACTION
300 A-B	285	Concrete pipe on R/W	checked OK
300B	289	Farm house being moved on R/W	checked OK
300B	369 310	Bulldozer & carryall on R/W	checked okay
100	354-1/8	3' bare spot	Valve stem leaking - repaired
Stanpac	185	Earth slippage	Under surveillance
300B	427	Erosion near culverts	to be repaired - patrol road
131	42	Survey crew on R/W	State Highway Survey
300A	310-1/2	Bent telephone pole	not our pole

Fig. 2. Aerial patrol report.

To mark the line adequately and furnish visual alignment, from the air, was the next step in the program. We had installed, at the time of line construction, sufficient pipeline markers to show line locations. Test flights indicated that the line location was, in most instances, sufficiently marked for satisfactory aerial patrol.

Facilities used for line alignment are as follows:

1. Mainline valves.
2. City gate meters and branch main taps.
3. Telephone line parallel to main.
4. Pipeline markers.
5. Ditch berm in uncultivated areas.

The problems of determining mileage locations for reporting were solved with:

1. Enameled mileage numbers installed at intermediate blow-offs.
2. Mileage designation painted on tops of wooden tops of valve vaults.
3. Pilot provided with map showing:
   a. General terrain.
   b. Pipeline delineated on map.
   c. Mileage of valves and important points posted to map.

Identification of location was thus accomplished at intervals of not more than five miles.

• Communications

Our radio communication system was installed to operate and maintain our pipeline system and to provide a second line of communication in event of physical telephone circuit failure. Thus it afforded an opportunity to establish full time communications, via radio telephone, with the pilot. Base radio transmitter and receiver stations are so located along the line to insure communications from any spot along the flight patrol. A radio transmitter and receiver were installed in the pilot's plane after test, with a portable set, had been made to insure satisfactory operation characteristics. Thus the pilot is able, at any time during his flight, to converse with base stations or radio equipped line crew cars. This close communication results in immediate notification of any trouble or condition which may require action without delay.

• Flight schedule

The contractor hangers his plane at Bakersfield and all flight schedules originate from this base.

The mains from Bakersfield to Topock, and laterals en route, are covered in a single day. The northern flight, Bakersfield to Milpitas and Antioch, can be covered in a single day during the summer months. During the winter and on days that lateral line patrolling is required, it, at times, becomes necessary to split the northern flight into two days of flight.

Fig. 1 is a typical schedule, made up three months in advance.

Observers were assigned to early flights for purposes of acquainting the pilot with the location of the mains, the mileages, the points for which observations were to be made, and to satisfy ourselves that the patrol would meet expectations. This practice was discontinued after two months when we were satisfied that the pilot would make an adequate patrol without assistance.

• Weather

During the winter months, November through March, flight schedule may be disrupted because of inclement weather. Storms over the Tehachapi mountains may make observation of the line impossible.

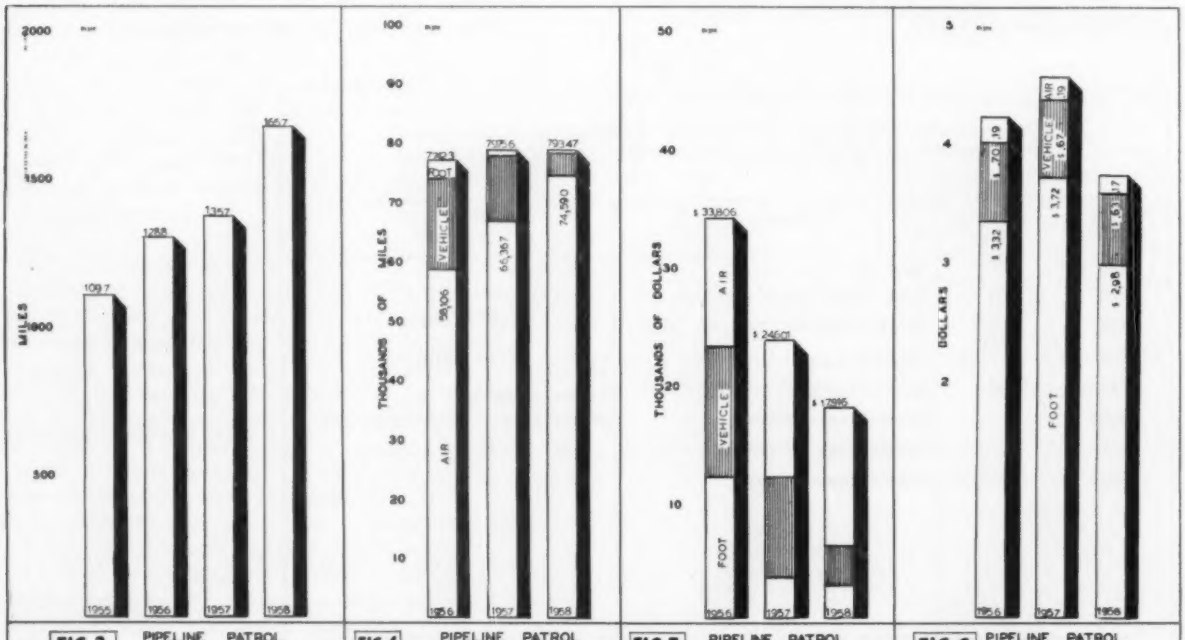


FIG. 3 PIPELINE PATROL MILES OF PIPELINE

FIG. 4 PIPELINE PATROL TOTAL MILES PATROLLED

FIG. 5 PIPELINE PATROL TOTAL YEARLY COST

FIG. 6 PIPELINE PATROL COST PER MILE

These storms may extend above the ceiling ability of the plane. Under such a condition the desert area patrol is delayed until more favorable weather.

Fog, throughout the San Joaquin and Santa Clara valley, may cause a delay in departure time or postpone the flight.

Flights are purposely scheduled in the early part of the week so that, if postponement of any flight is necessary, it can be rescheduled for later in the week.

To obtain the most complete weather information available our company meteorologist reports to the flight coordinator daily a short range forecast for the areas in which lines are to be patrolled. This information is given to the pilot. CAA and Weather Bureau forecasts are ascertained by the pilot. Armed with this information the pilot makes the decision as to the advisability of attempting the scheduled patrol.

• Reports

When a patrol is started, the pilot notifies Kettleman control center, via radio, the time of the departure and route of flight. Kettleman notifies all stations, by teletype, information received from the pilot. As the flight progresses, the pilot notifies each of the stations along the route of his location and gives to the station operator reports of any trouble or evidence of work on or near the right-of-way which should be investigated.

At the conclusion of the patrol the pilot, via telephone, notifies the Flight Coordinator of the results of the patrol. A written report of the patrol follows, copies of which are routed to interested personnel on the form shown in *Fig. 2*.

• Results

Aerial patrol is normally done at an elevation of about 200 ft above ground surface. Weather and ground surface conditions may alter this elevation. In extremely hot weather in the desert, elevation is increased to accomplish the work with safety. In the mountainous areas increase in this 200-ft ground clearance is also required.

At this elevation and flying at approximately 100 miles per hour, good results are obtainable. The pilot has been repeatedly successful in spotting leak indications. In many instances the leaks have been of a very minor nature and indications very slight. Recently, on a new section of line, the pilot reported leaks which, on investigation, turned out to be pin hole leaks in circumferential welds or porous leaks in the longitudinal seam. One of these leaks was of such a minor nature that, after excavation had been made and the wrapping removed, the area was soaped to pin-point the leak.

Any activity, such as seismic work or construction, near the right-of-way is immediately reported and investigated. Potential damage to our mains is thus averted.

Our satisfaction with the results of aerial patrol has been such that more and more of our lines are now being covered by this method. At the inauguration of our aerial patrol program we had 1097 miles covered; by 1958 we had increased this activity to 1657 miles, an increase of 51 per cent (*Fig. 3*).

TABLE 2. PIPELINE PATROL EXPENSE—VARIOUS MAINS COMPARISON OF COSTS—1956-1958

	1956	*1957*	*1958*
FOOT PATROL	*($)*	*($)*	*($)*
Main 100	2,246.62	500.12	1,074.72
Various Mains (198)	1,210.76	183.62	184.68
Main 300	8,511.28	2,770.20	1,373.65
Sub Total	11,968.66	3,453.94	2,633.05
AUTOMOBILE			
Main 100	2,079.40	1,507.94	442.86
Various Mains (198)	1,381.88	748.66	409.28
Main 300	7,472.69	6,057.15	1,581.29
Sub Total	10,933.97	8,313.75	2,433.43
AERIAL			
Main 100	1,500.93	1,656.23	1,679.22
Various mains (198)	1,036.83	1,452.12	1,471.26
Main 300	8,366.52	9,725.21	9,699.15
Sub Total	10,904.28	12,833.56	12,849.63
TOTAL	33,806.91	24,601.25	17,916.11

• Cost

Definite costs are not available for the year 1955, the year in which aerial patrol was inaugurated on our system. Patrolling by car was continued at a diminishing rate as it became more and more evident that the aerial coverage was superior to car patrol. Foot patrolling was continued on a monthly schedule during 1955.

By 1956 our confidence in the effectiveness of aerial patrolling was such that both car and foot patrolling were drastically reduced with further reduction being made in 1957 and 1958.

Costs of our line patrols are listed on *Figs. 4, 5 and 6* for the years 1956, 1957 and 1958. The year 1956 cost of $33,806 covered the expense to patrol 1288 miles contrasted to a cost, in 1958, of $17,916, for patrolling 1657 miles.

Had we continued with our 1954 patrol method we would have expended $59,800.

Table 2 is a detailed comparison of cost of patrolling performed for 1956, 1957 and 1958.

Our conviction is that the aerial method of pipeline patrolling has proven highly successful for our purpose for the following reasons:

1. Aerial survey has proven more adequate than vehicle and foot patrol combination.
2. It has provided a tool which insures uniform coverage.
3. It has resulted in an appreciable monetary saving.

May I emphasize in conclusion that the backbone of an aerial patrol program is the pilot. His integrity, his conscientious devotion to the job at hand and his experience are vital requirements in a successful aerial pipeline patrol program. ■

This article is adapted from a talk presented to the 1959 transmission conference of the PCGA, Palm Springs, Calif.

MEN, MACHINES, IMAGINATION and BETHLEHEM LINE PIPE

Make Commonwealth Loop a Reality

IMAGINATION AT WORK. To wrestle the pipe through the stump-studded mire would have involved too much time and effort. So Latex capped the pipe and floated it into position along the water-filled ditch.

PROBLEM: FIND THE TRACTOR. It took great skill to move in and out of the undergrowth without bogging down or snagging a tree with the boom.

Deep in Virginia's Blackwater Swamp, the Latex Construction Company pushed through a new looping line for Commonwealth Natural Gas Corporation. From Ivor to Suffolk, the men battled mud and water, heat, insects, and dense undergrowth. But they never had to battle the pipe: each length of the 12¾-in. OD Bethlehem electric resistance-weld line pipe proved to be up to specs, and true to round and bevel. Result: the loop was completed on schedule, and approved for service after a single test of 800 psi pressure.

Your next line, too, will go in smoothly if you specify Bethlehem line pipe. It's a top-quality product you can rely on. Just give us a call.

THE FASTEST ROAD—and the cleanest—was often along the pipeline, itself.

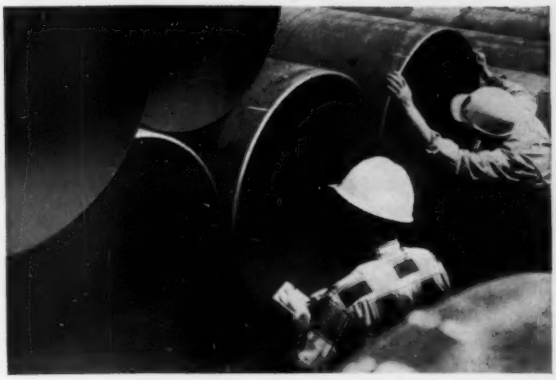
BETHLEHEM STEEL

BETHLEHEM PRODUCES LINE PIPE TO 42-IN. OD

Hydraulically expanded electric-fusion-weld API pipe from 18-in. to 42-in. OD in 40-ft lengths with walls to ¾-in. in the larger diameters is made at our Steelton, Pa., plant. Electric resistance-weld pipe from 5¾-in. to 16-in. OD in lengths to 60-ft, and Beth-Co-Weld continuous buttweld pipe up to 4½-in. OD to standard API line pipe specifications are made on our Sparrows Point, Md., pipe mills.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



BETHLEHEM STEEL

With new control

Wind-type disturbances become still-day conditions

THE costly, time-consuming problem of controlling heat loss in heating and treating units used in oil and gas processing and production operations is one of long standing. It is a universal problem. It affects practically every industry which depends on even temperatures for efficiency in production.

The trouble, in most cases, lies with down-drafts and wind-caused disturbances which mean fluctuations in the fire box . . . and uneven heat.

An encouraging solution to this problem has been found in a positive draft control system.

The system was invented and patented by W. O. Moran, owner of the Moran Furnace and Sheet Metal Co., Tulsa. Moran's positive draft control approaches the heat loss problem as a "preventive" rather than a cure—by eliminating the cause of fire box disturbances.

On the theory that all heating units operate at peak efficiency under "still day" conditions, Moran has perfected his system to attain and maintain "still day" zones in both stack and burner areas.

This phenomena is achieved by eliminating all effect of wind at the top of the heater stack and at the burner inlet.

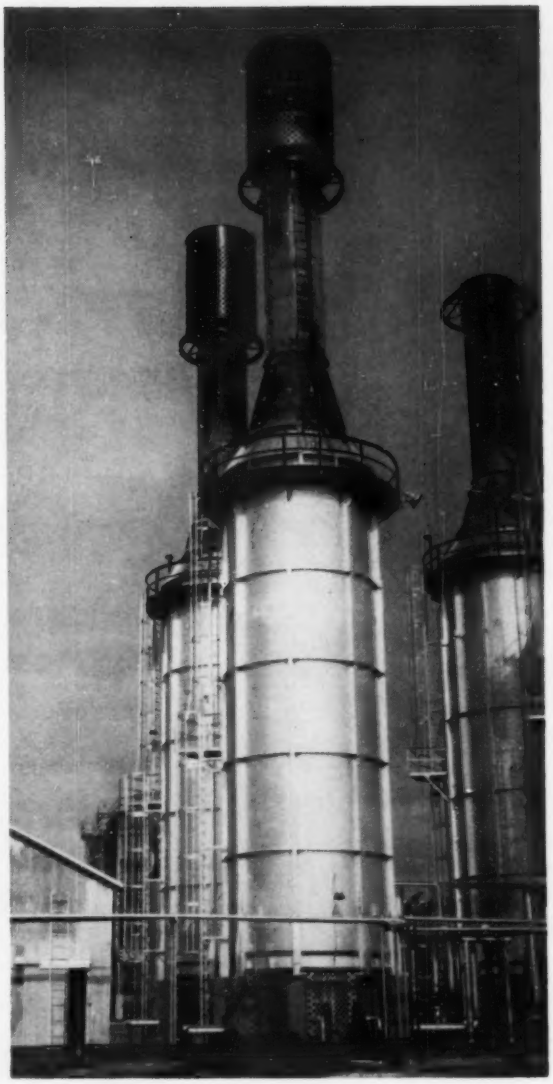
The positive draft control system is composed of a draft equalizing stack head at stack top, plus a draft equalizing inlet control and capacity chamber at the burner inlet.

By eliminating the effect of wind, the system accomplishes "still day efficiency," assuring perfect combustion and unvarying temperatures—even during high, gusty winds.

The system permits operation of heating units at maximum fire box temperatures at all times, burning all fuel in the fire box, thus causing greater heat transfer from fuel to load.

Thoroughly field tested and already in wide use throughout the oil and gas industry, the Moran positive draft control has proven its worth in reducing fuel costs, increasing quality and quantity of processed products, cutting maintenance costs and increasing the life of heater units.

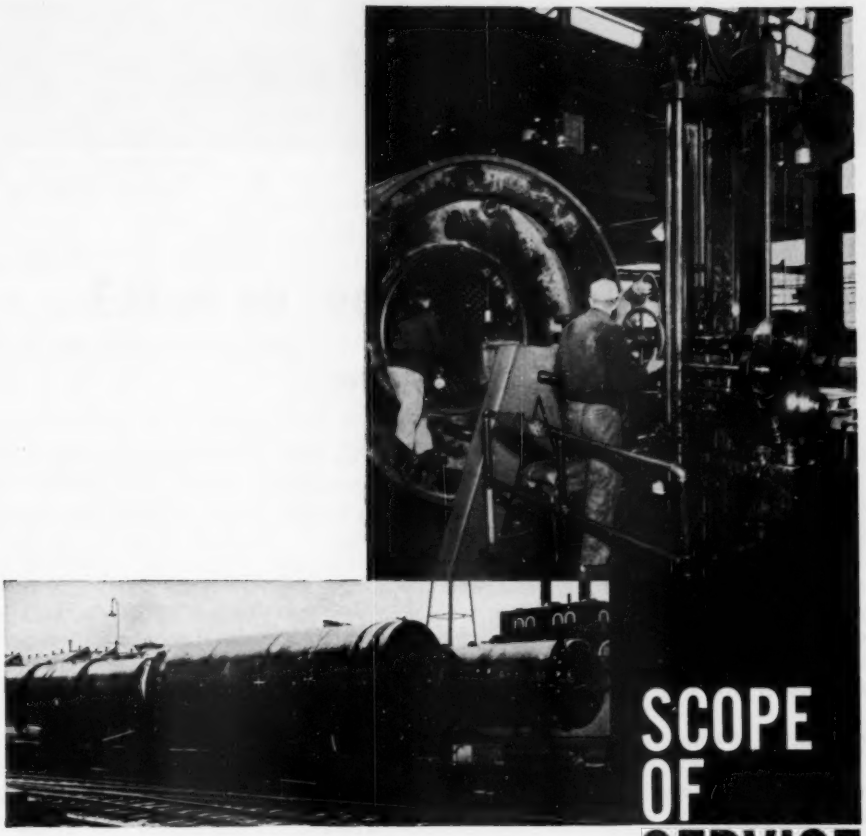
Installed under emergency conditions on a heater unit at the Glenrock, Wyo., gasoline plant of Cabot Carbon Co., a Moran positive draft control system has maintained unvarying temperatures since early spring, even during wind gusts registering from 80 to 100 miles per hour.



"Still day efficiency" is created by positive draft controls installed in two Petro Chem rich oil heaters in Mayesville, Okla. Visible on top of the stacks of the two unit heaters are draft equalizing stack heads. They measure 10 ft in diameter and 15 ft high. Note perforated draft equalizing inlet controls at bases of heating units.

Similar results were obtained at the Garvin County plants, operated by Warren Petroleum Corp., at Mayesville, Okla., where the system was installed on two Petro Chem rich oil heaters.

Often used in conjunction with the positive draft control is the Moran Safety Flash Arrester, which prevents flash fires and explosions from heating units and minimizes danger in hazardous areas. The flash arrester is adaptable to space heaters, industrial heaters and pipeline installations. ■



SCOPE OF SERVICE

For 43 years the facilities of this large and well-equipped plant for ship and engine building have been employed in building special equipment for oil refineries and chemical plants.

This equipment varies from small tanks to large Fractionating Towers, Stills, Pressure Vessels, Special Machinery, Plate Work, etc. Carbon or alloy steel-annealed and X-rayed.

THE PLANT—Our plant consists of such a variety of shops and machinery that it is unnecessary to sublet when building the type of equipment here listed. The plant consists of:

Boiler and Tank Shops

Steel Fabricating Shops	Machine Shops
Blacksmith Shop	Pipe Shop
Anglesmith Shop	Electric Welding
Coppersmith Shop	Stainless Shop

RAIL OR WATER SHIPMENT—Our plant, located on the Delaware River with piers and deep water to care for sea-going ships, has railroad connections to all points.

We have adequate facilities to handle our work in all its phases and do not have to sublet.

Further information, estimates or proposals on request.

Sun

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Edited by FRANK CHAPMAN

The vanishing tube, or is it?

By F. VINTON LONG

WE have all heard a lot of talk about transistors and just how good they are and how, almost any day now, there will be no more tubes. Now that the smoke is beginning to settle around the big furor caused by the advent of transistor techniques, I think that we might just take a little look around and see where they are as of today.

There is still quite a bit of controversy as to whether a transistor or a tube should be used in any product. That also applies to products used in gas pipelines, in the communication systems, and in other things, which up to now have been using vacuum tubes of the hot cathode type. Please note that this does not include the latest cold cathode type, which, although it has received some publicity, is not yet available to us.

In the first place, there are certain spots where transistors are indicated, such as if available power input is limited and high power output is not a prime requisite, the use of transistors is a logical thing. This includes hearing aids, personal portable radios, or even space satellites, which are supplied by battery power. In these cases the low drain and high efficiency of these devices are the prime factors. On the other hand if the equipment is to be a-c operated these factors are of little consequence.

Other considerations may well favor the use of tubes over transistors. Sometimes fixed station transmitters and receivers can be made simpler and more economical using tubes.

One of the bugaboos of the transistor family is their temperature conscious characteristics, whereby the ambient operating temperature change in many cases is a serious threat to efficient operation.

Tubes, on the other hand, can operate quite well above 200 deg C in the glass types and over 400 deg C in the ceramic, with practically no change in characteristics. Thus, the use of transistors under varying ambient temperature conditions requires a great deal of attention to temperature compensation elements and feedback circuits. This is ordinarily unnecessary when tubes are used.

Transistors are quite difficult to manufacture, especially in production, for use with frequencies above 500 kilocycles. There is always a fundamental conflict between barrier thickness, area, and carrier mobility versus capacitance, gain, and power handling ability (heat dissipation) with increasing frequency. Tubes, of course, have this trouble, too, but not as badly.

One of the troubles, as many of us have found out, is that no two transistors seem to be exactly alike. Although they are supposed to be replaceable with identical models, sometimes this is not so.

Although they have less microphonics, it appears that transistors have an inherently higher random noise output than tubes when considered on a noise power basis.

As mentioned before, the properties of semi-conductors are more difficult to control in production than those of tubes, resulting in a quite wide spread of product characteristics. Therefore, the manufacturers in many cases are simply giving the different types of tubes that come out of the pot a new number, and right now I believe there are about 700 type numbers, not counting the experimental numbers, and that is an awful lot of types for a user to choose from.

This small size of the transistors, of course, makes them very useful in computer applications and they of course dissipate less heat although more care must be taken to keep them cool, compared with tubes.

As far as pipeline users are concerned, there is no great advantage in the use of transistors instead of tubes until one important thing takes place.

This thing is the advent of the UHF transistor, which would replace a conventional microwave transmitting or receiving tube.

As long as we have to have one vacuum tube in a microwave repeater station, it might as well be all vacuum tubes. However, if the time should ever come, and I hope it will, when we have the black box on the scene, as I have so often preached, then the telephone pole or fence post mounted microwave repeater station will be a reality.

At that time, and only at that time, will low density microwave begin to compete economically with the services of the common carriers.

I have heard much about this thing. I have heard that many laboratories are working on this missing link, but so far we have not seen one.

It will be a happy day for the pipeline communication engineers when such a completely transistorized fence post mounted single channel microwave relay station is available. ■

TELETAX* TELEMETERING

by Foxboro...

engineered for the most advanced transmission techniques

Telemetering matched in performance with famous Foxboro instruments — that's the Foxboro Teletax Telemetering System.

Through use of impulse-duration signals, Teletax electrically transmits measurements of a remotely-located variable to the central control station. Here, the Teletax receiver records the duration of impulse, which is directly proportional to the measured variable.

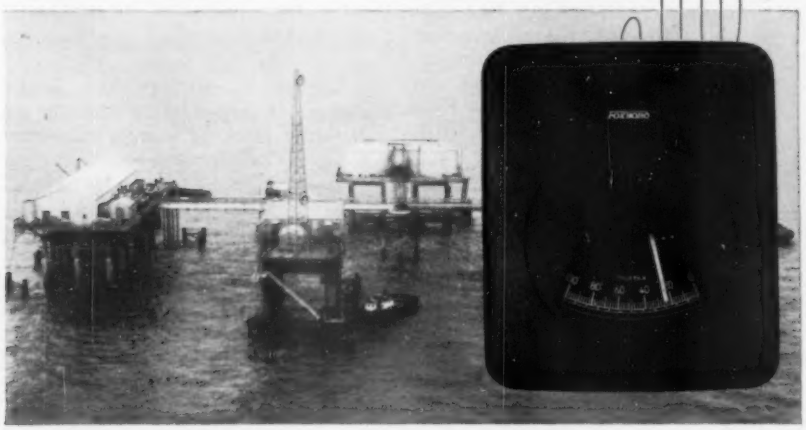
The Foxboro Teletax System is noted for its simplicity, its versatility, and its high sustained accuracy. For a transmission medium, it can use either AC or DC, an audio frequency carried on a transmission line, or radio or microwave impulses. Sustained accuracy is 0.5% of full scale.

TELETAX RECEIVERS

Teletax receivers include: Single or Dual Receivers; Multi-Record Receivers for recording up to 6 separate measurements on one chart; and Teletax Receiver-Controllers for automatic operation. And the Teletax signal can be simply converted to digital information.

TRANSMISSION LINK

With Foxboro's Teletax Telemetering System, you can use the most advanced transmitting techniques: two wire lines, power lines, radio or microwave. As many as 25 different signals can be handled in each direction, simultaneously.



TELETAX TRANSMITTER

The Teletax Transmitter houses either one or two standard Foxboro measuring elements — plus the Teletax transmitting mechanism. It will transmit to a control center hundreds of miles away just as easily as to one nearby. It also indicates or records locally if desired.

The Teletax Transmitter needs no periodic maintenance whatever, while the receiver requires only occasional oiling. And the receiver has a minimum of mechanical components to wear — no clutch to slip or jam.

Foxboro Teletax Systems are now in wide use on natural gas systems, water works, oil fields, power plants, steel mills, etc. Write for Bulletin 17-11C — it gives all the details. The Foxboro Company, 342 Norfolk Street, Foxboro, Mass.

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GAS Pipeline People

Four men have been appointed to key posts with Transwestern Pipeline Co., Houston. PAUL F. MCBRIDE has joined the company as operations manager. Until his appointment, McBride was in charge of operations and engineering at Pacific Northwest Pipeline Corp. WILLIAM A. KOROS is controller and assistant treasurer and secretary. Formerly he was assistant to the vice president, rate department, of the Charleston Group of the Columbia Gas System. BEN A. COPASS JR. is manager of gas purchase contracts. Copass has been a sales representative in Humble Oil's marketing department, handling purchases and sales of liquid gas plant products. LESLIE M. FISHER is superintendent of Transwestern's Puckett gas purification plant at Ft. Stockton. He has been plant superintendent of the Carthage Corp. processing plant and assistant district superintendent.

JOSEPH H. LANG, vice president in charge of transmission for Ohio Fuel Gas Co., Columbus, has retired. Lang started with the company in 1914 as a mechanic, was promoted to gas measurement superintendent 16 years later. In 1935 he became general superintendent of pipelines; in 1951 assistant manager of transmission.

Promotions involved in the recent merger of M. J. Crose Manufacturing Co. and Perrault Equipment include: JOHN W. BRAND, vice president and general manager. He will retain active management of the Canadian subsidiary Crose-Curran Ltd. in addition to his new duties. JOHN BEHRENFELD, a vice president, transfers to New York City where he will head up Crose's export department. BEN MONTGOMERY, newly elected vice president, also is in charge of the company's Houston division. W. H. ROYAL has been appointed sales manager, the post formerly held by Behrenfeld. Royal moves to Tulsa from Denver where he was manager of the western division of Crose.

STEVE AICHEL has been appointed manager of the southeastern sales office for Cal-Metal Pipe Corp., Baton Rouge. Aichel will headquarter in Jacksonville, Fla., covering Florida, Georgia, the Carolinas, and Virginia.

MAX P. WATSON has been promoted to assistant to Ed Parks, president of United Gas Corp. and its wholly owned subsidiaries. Watson has been gas purchases manager of United Gas Pipeline Co., Shreveport.

DEWITT A. FORWARD has been elected a director of American Natural Gas Co. Until his retirement, Forward was a director and vice chairman of the board of the First National City Bank of New York.

RUSSELL C. TAYLOR has been elected president and JAMES F. CLARK chairman of the executive committee of ACF Industries Inc., New York. Clark has been president since 1954. Taylor is taking early retirement at the age of 55 from the American Can Co. where he was an executive department vice president and director.

John Brand
Crose-Perrault

John Behrenfeld
Crose-Perrault

Ben Montgomery
Crose-Perrault

W. H. Royal
Crose-Perrault

ROBERT O. PARKER, assistant controller of Trunkline Gas Co., Houston, has been elected to membership in the Controllers Institute of America.

ROBERT A. GIORGI is manager of market development for two-way radio equipment at General Electric's communication products department headquarters in Lynchburg, Va.

A. W. LEVAN has been elected to the office of secretary and to the board of directors of Cities Service Gas Co., Oklahoma City. He has been assistant secretary and general auditor. He also is a director of Cities Service Gas Producing Co., a subsidiary.

J. E. BYERS has been appointed regional sales manager of Black, Sivalls & Bryson's Gulf and Pacific regions. He formerly was Tulsa district sales manager.

W. R. MORTON, secretary and director of Cities Service Gas Co., has retired after 50 years with the company. His career began with Knoxville (Tenn.) Gas Co., affiliated with Cities Service, in 1909. He has been directly associated with Cities Service Gas Co. since 1939, serving as assistant secretary until 1944 and as secretary since that time.

VICTOR M. MORGAN has joined Daniel Orifice Fitting Co. in its Houston office as a sales engineer.

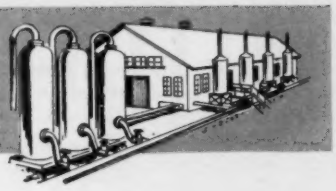
GARDINER SYMONDS, board chairman and president of Tennessee Gas Transmission Co., Houston, is national chairman of the 1960 Invest-in-America Week.

DONALD E. RICE has been appointed vice president-operations of Columbia-Geneva Steel Division, U. S. Steel Corp.

CLEM B. CONNALLY is coordinator of natural gas sales for Continental Oil Co., Houston. He succeeds FRED B. WILLSON, recently named assistant director of natural gas activities for Conoco.

HAROLD C. PRICE JR. has been elected president of H. C. Price Co., Bartlesville, Okla. HAROLD C. PRICE SR. becomes chairman of the board. Newly elected vice president is R. K. SHIVEL.

GAS PIPELINE NEWS



Columbia Gulf describes experimental compressor

COLUMBIA Gulf Transmission Co. (Houston) has FPC authorization to construct and operate its experimental gas turbine compressor unit. A modified aircraft jet engine will be a component of the new, specially designed gas turbine. The latter will drive a centrifugal compressor.

The installation will be made at an existing compressor station near Clementsville, Ky. The prime mover will develop 10,500 hp. The pioneering compressor unit is being jointly developed by Cooper-Bessemer and Pratt & Whitney Aircraft. It will be remotely controlled.

The unit flanges up like this: A J-57 jet aircraft engine, modified to burn natural gas, is used as the power generator. Its thrust is converted into rotating horsepower by the newly designed Cooper-Bessemer RT-248 gas turbine. The turbine will drive an RF2B-30 C-B centrifugal compressor.

The new gas turbine is in its advanced experimental test phase at the P&W plant in East Hartford, Conn. Station construction will be simultaneous with turbine development.

FPC said results of the experiment may influence future installations for capacity increases, "and," the FPC continued, "it may provide valuable information to the gas industry which may enable lower costs to the consuming public."

The dynamic installation will cost about $1.55 million. Cooper-Bessemer will furnish the unit without charge for a test period of 8000 hr, or 18 months, whichever occurs first. The compressor manufacturer will also pay $250,000 toward the cost of construction, making a total C-B contribution of $1.025 million. Columbia Gulf will provide the remaining $529,000.

Pioneering is nothing new to Columbia Gulf Transmission, a pipeline subsidiary of the Columbia Gas System. Its trial of the jet aircraft engine joins other pioneering projects such as designing and operating the first mainline semi-automatic reciprocating compressor units, and the first completely automatic multiple-engine centrifugal compressor station remotely controlled from a single, central location.

Columbia Gulf, like all gas pipeline companies, is faced with rising cost compounded with expanding demand. They hope the new jet engine and power turbine will show sharp reduction in first installation cost, maintenance cost, and the cost of moving gas.

"The important thing about this proposed new installation," says John W. Kelley, Columbia Gulf's president, "if it meets tests, is its ability to cut original installation costs by 50 per cent."

The jet engine will be removable for major repairs and overhauls. This is in sharp contrast with conventional compressor prime movers. It is estimated a jet engine can be changed out in 4 hr of downtime. An in-service engine is simply pulled out, and a spare installed. The removed engine can be shipped to the factory, if necessary. Hence, the industry may see an elimination of large spare parts inventories and full crews of mechanics.

GAS has been told that the basic J-57 turbojet engine is a bit on the obsolete side for the Air Force, and might be purchased rather cheaply. Too, commercial jets are now calling for more advanced versions of the engine. So, some surpluses are around. However, the modification to convert these units to provide thrust for the new turbine has to be considered.

Offsetting some savings is the expectation that fuel costs for the jet engine will be higher than for conventional engines. But, an additional saving is expected due to the new power plant requiring only half the space needed for power plants now used — hence, less housing construction appears in the offing. Another saving will be the reduction of foundation requirements.

The 10,500-hp jet-turbine will weigh only 12 tons. Compare this with 356 tons for three gas engines now used totaling the same horsepower.

Construction of the experimental station facilities started Feb. 1, with completion scheduled for July.

Blending pending?

After informal ceremonies marking the dissolution of Texas Illinois Natural Gas Co., now known as Peoples Gulf Coast Natural Gas Pipeline Co., Eskil Bjork, chairman of Peoples Gas Light & Coke Co., was quoted thusly: "Down the road sometime, I hope that we may be able to merge Peoples Gulf Coast . . . with Natural Gas Pipeline Co. of America to obtain the economies in operation and other advantages which such a merger can bring about."

Rocky Mt. unit formed

El Paso Natural has set up a new Rocky Mountain region, headquartering in Salt Lake. The new unit will perform the functions of the former Pacific Northwest Pipeline Corp. plus those of El Paso's San Juan division.

Major western expansion gets hearing

HEARINGS will begin Feb. 1 on the $150 million construction plans of El Paso Natural Gas Co., Colorado Interstate Gas Co., and Pacific Northwest Pipeline Corp.

El Paso's proposal: Sell up to 470 MMcfd to Southern California-Southern Counties Gas companies. El Paso would buy up to 235 MMcfd from Colorado and from Pacific. (Colorado would transport the combined volume, 470 MMcf, from Rock Springs, Wyo., for delivery to El Paso near Provo, Utah.) El Paso's construction involves about 294 miles of 34-in. line from Thistle, Utah, to the California-Nevada boundary, southwest of Las Vegas.

Colorado Interstate's plan: 359 miles of 20- to 34-in. pipe from Texas' West Panhandle field to Denver; 85 miles of line tying in new reserves in Kansas, Oklahoma, and Wyoming; reverse flow of its existing line between Denver and Green River, Wyo.; 155 miles of 34-in. line between Green River and Provo; and 32 miles of 6-in. line in Colorado. CIG also plans nine compressor stations aggregating 45,980 hp, plus adding 32,600 hp to four existing stations. It will retire the major portion—about 275 miles—of its Bivins, Texas-Denver line and seven compressor stations totaling 27,115 hp. CIG also will use the new facilities to hike its daily delivery capacity in the Rocky Mountain area by about 49 MMcf.

Pacific Northwest's plan: Build a measuring and regulating station to handle its proposed sale of gas to El Paso.

Money involved: El Paso, $58.6 million; Colorado Interstate, $91.1 million; Pacific, $173,000.

Northern backs storage study

A study to help industry develop underground storage facilities has been undertaken by an Oklahoma State University engineering professor. The $32,000 study by Dr. David Cornell will take two years. Northern Natural Gas Co. is sponsor of the project.

Major objective is to determine mechanics of gas storage in aquifers, water-bearing formations in the earth. Aquifers seem promising for big consumption markets such as the northeastern and north central areas of the U. S., Cornell says.

Producers supplied 6.8 trillion cu ft

INDEPENDENT gas producers supplied more than 6.8 trillion cu ft to interstate pipeline companies in 1958. Revenues of $890.6 million, for a 13-cent per Mcf average, were recorded, according to an FPC staff report.

About 5600 producers sold 6.8 trillion cu ft of gas, compared with 6.5 trillion in 1957. Revenues in that year were $787.2 million for a 12-cent-per-Mcf average.

In addition, interstate pipelines themselves produced 809.9 billion cu ft in 1958. And, they purchased more than 9 billion cu ft of manufactured and LPG.

The 1958 sales to pipelines were made by producers in 21 states and in Canada and Mexico. Of the total sales, 91.4 per cent were from producers in five states: Texas, 48.2 per cent; Louisiana, 26.5; New Mexico, 6.1; Kansas, 5.8; and Oklahoma, 4.8.

Forty-eight (less than 1 per cent) of the producers—alone or as the first named in combination with others—supplied about 63 per cent of the gas purchased in '58. Two hundred and fifty (4.4 per cent) reported sales of 2 billion cu ft more. These sales accounted for 91.2 per cent of both the total natural gas supplied and total revenues received.

Pipeline progress

Houston Texas Gas & Oil Corp. was honored recently for contributions made to big inch pipeline progress. R. E. Stanley (left), chairman of Houston Texas Gas, received the plaque commemorating the company's first use of Polyken protective tape coatings on 1600 miles of pipeline from Baton Rouge, La., to Miami, Fla. Making the presentation is W. J. Hodges, general sales manager of the Polyken Sales Division.

Florida suppliers want to boost system capacity

Houston Texas Gas & Oil Corp. and Coastal Transmission Corp. want to increase gas supplies to Florida (Dockets G-18338 et al).

Houston plans to build five new compressor stations with 4000-hp each and about 199 miles of 2- to 6-in. lateral lines. Cost is estimated at $12.5 million.

Coastal's plans involve 81 miles of 3- to 10-in. lateral lines; compressor stations at Port Lavaca, Texas, and Eunice, La., with capacities of 2200 and 3300 hp, respectively; and an additional 1500-hp unit at its existing station near Robstown, Texas. This work is estimated to cost $6.2 million. Coastal's system capacity will increase by 60 MMcfd to 338 MMcfd. Average daily delivery by Coastal to Houston at Baton Rouge would be about 335 MMcfd.

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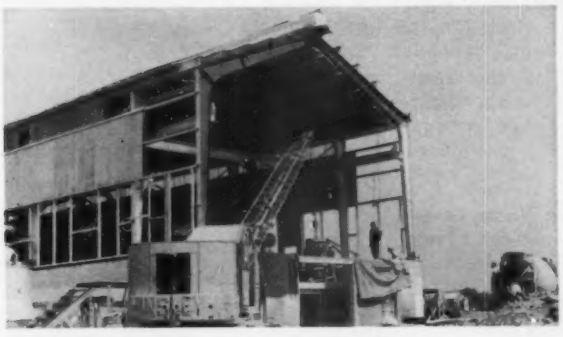

Yes, repeating business and *LATEX* go hand in hand. For over one quarter century LATEX has been serving the oil and gas industry. Invite us for your next construction job.

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Seeks review of Kansas ratable order

NORTHERN Natural Gas Co. is seeking a review of a Kansas Corporation Commission order. Northern was told to take gas ratably from all wells to which it is connected in the Hugoton field.

Vice President John M. Hanley said his company is not challenging the commission's ratable take concepts. "But we do question the commission's right to abridge private contracts between Northern and well owners. . . . This is a matter which should be reviewed by the courts, since it places the obligations in private contracts in doubt."

The commission found that Northern's performance under its contracts did not result in ratable taking of gas from all of the 1100 wells connected to its system. Northern contends that since the owners have specifically agreed upon a different practice of purchasing gas, the commission's order is an infringement of the rights of private contracts.

Transwestern plans expansion

Transwestern Pipeline Co.'s system will have added facilities before it's completed, if FPC approves a recent application.

New facilities are planned in the Texas and Oklahoma Panhandle and Permian Basin areas of west Texas and New Mexico. They will annex to Transwestern's system—during its initial construction—gas from some 49 added purchase agreements. The $5.8 million facilities will make available more than 500 billion cu ft of gas reserves for Transwestern's customer, Pacific Lighting Gas Supply.

PNW signs contract for Wyoming reserves

A $200-million gas contract has been signed by Pacific Northwest Pipeline Corp. and Belco Petroleum Corp. Involved is 1 trillion cu ft of gas from Belco's field in southwest Wyoming. Under a previous contract, almost 1.2 trillion cu ft was already dedicated to PNW.

Belco also has a contract with El Paso Natural for the extraction of liquid petroleum and hydrocarbon products from the gas.

Two sales contracts were signed, both of which are subject to FPC approval.

The first dedicates 300 billion cu ft and goes into effect July 1, 1960. Pacific must take or pay for up to 30 MMcfd. And Belco must be able to deliver up to 40 MMcfd. Initial rate for high pressure gas is 18.5 cents per Mcf with three 1-cent escalations at 5-year intervals. This gas will go to markets in Washington, Oregon, and Idaho.

The second contract, with similar terms, goes into effect Jan. 1, 1962. Its 700 billion cu ft depends on FPC approval of the Rock Springs, Wyo.-to-California facilities.

Independents rate increases suspended

FPC suspended rate increases totaling $10.9 million yearly proposed by 21 independent producers for gas sold to El Paso Natural Gas Co. In all, 118 increases were involved.

These were the first of the increases resulting from El Paso's renegotiation program. It is planned to eliminate favored-nation clauses and, in some cases, price redetermination rights, from suppliers' contracts in the Permian basin area. Phillips Petroleum Co. also gives up its spiral escalation increases.

Reworked rates range from 13.5 to 17.0 cents per Mcf, depending on quality of gas and delivery pressure. Total impact of the increases on El Paso's purchased gas costs is estimated at $22.8 million yearly, if all producers in the area renegotiate.

Safety mark set

Northern Natural Gas Co. completed 1 million man-hours of work throughout its 12-state and Canada system without a disabling injury. Safety Director Marvin B. Travis said this is the first time in its history that the company has topped the 1-million mark on a system-wide basis.

More than 3000 people are employed in the production, transmission and distribution phases.

The company recorded a safety figure of 4.42 injuries per million man-hours in 1959, an improvement of 33 per cent over 1958.

Travis credited "management emphasis" on safety and "the interest and cooperation of superintendents and employees" in the company's full-time safety program for the record.

Cooper-Bessemer expands in Canada

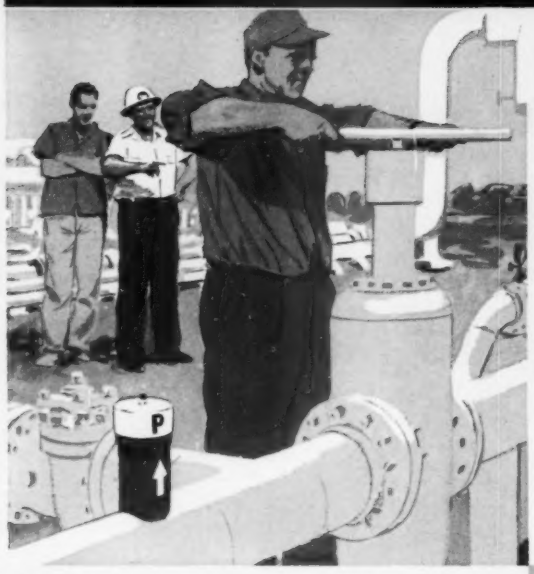
Cooper-Bessemer Corp. will begin manufacturing operations in Canada. Its wholly owned subsidiary, Cooper-Bessemer of Canada Ltd., will set up production in a plant leased from the Canadian National Railways at Stratford, Ont.

Since 1949, Cooper-Bessemer of Canada has served as a marketing organization with warehouse and service facilities. The company will lease part of the Stratford plant now, acquiring other sections as the Canadian market expands. It has been predicted that by 1980, production of natural gas and oil in Canada will be up as much as 790 per cent over 1960. Cooper-Bessemer is going to be ready for this expansion.

To sell line pipe

Dunwoody Pipe & Supply Co., Houston, has expanded into line pipe sales. Heading up the new division is E. Cary Link Jr. Previously, the Dunwoody firm, with branches in Dallas and New Orleans, has emphasized the sale of casing and tubing.

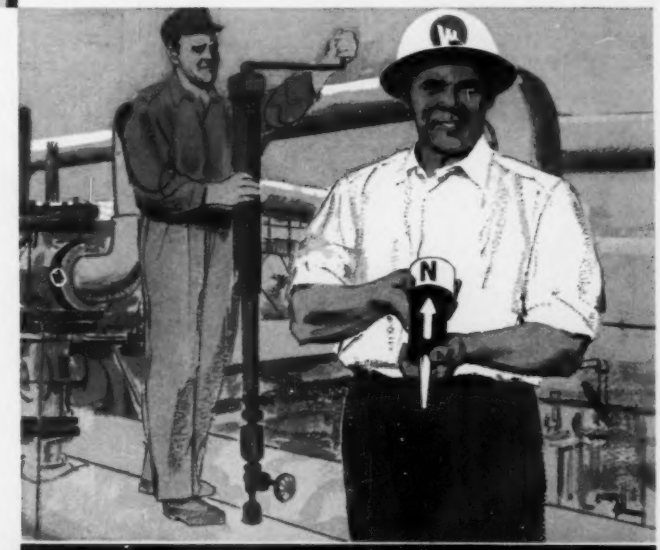
NEWS FROM DOWN THE LINE!



NEW WmSON "PIG-SIG II" CAN BE INSTALLED OR REMOVED UNDER PRESSURE!

❷ "The Pig-Sig II with the Electrical Indicator can signal arrival of pig to pump station operator or start operation of automatic equipment to open and close valves."

❶ "The station operator knows the pig has arrived because the Pig-Sig II visual indicator is in the "passed" position. He no longer needs to wait and listen at the scraper trap."



❹ "This completely new Pig-Sig II uses a standard 2" Thread-O-Ring Nipple. Easily installed under pressure with WmSon Tapping Machines, using a standard drill.
The Pig-Sig II is available with either an electrical or visual signal, extended or regular."

❸ "This new, improved long trigger action detects scrapers even in oversize pipe. Pig-Sig II is excellent for use in metering or calibration."

"Pig-Sig II" Patent applied for

• Write for Bulletin A-199

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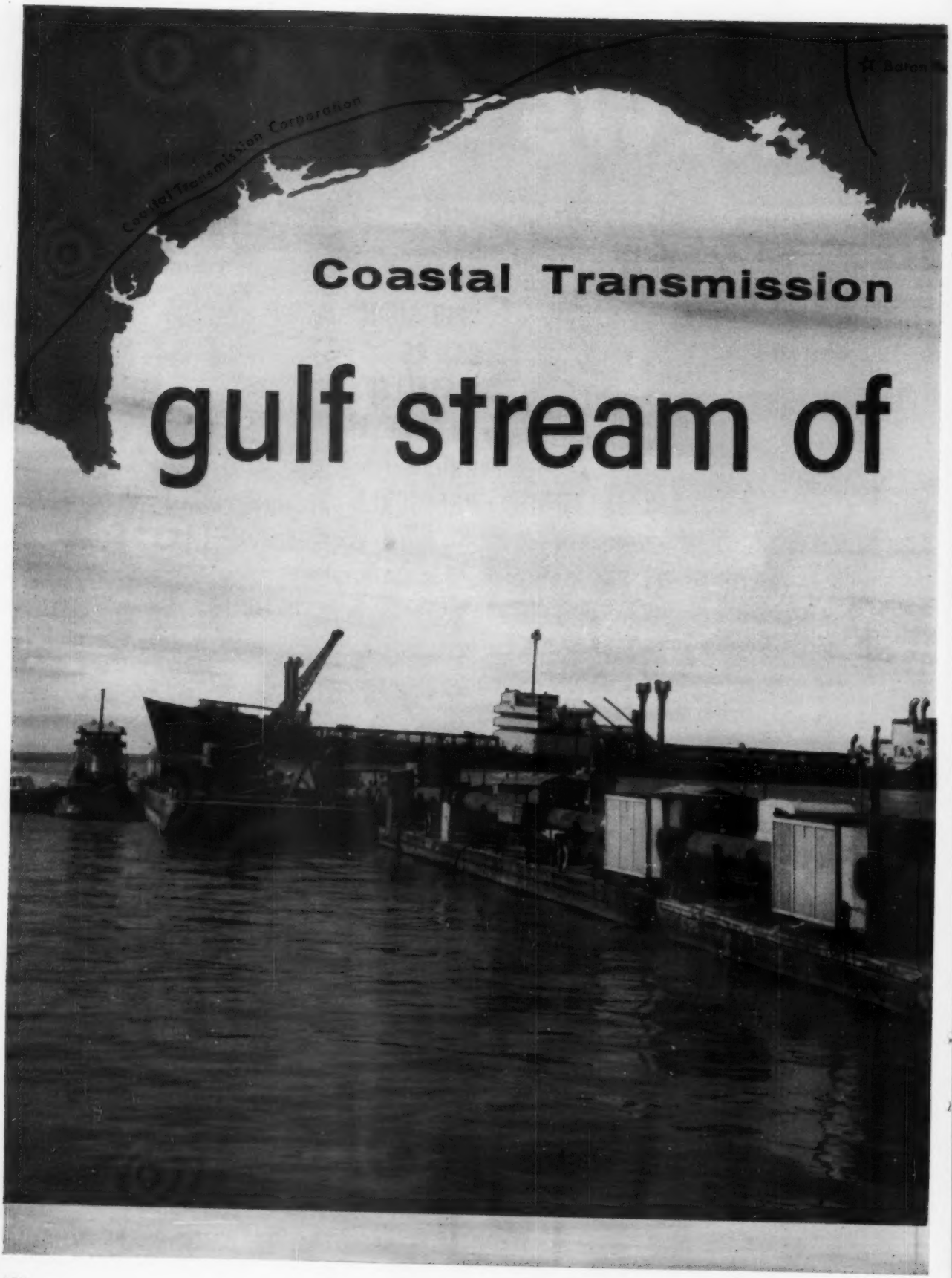
REPRESENTATIVES AROUND THE WORLD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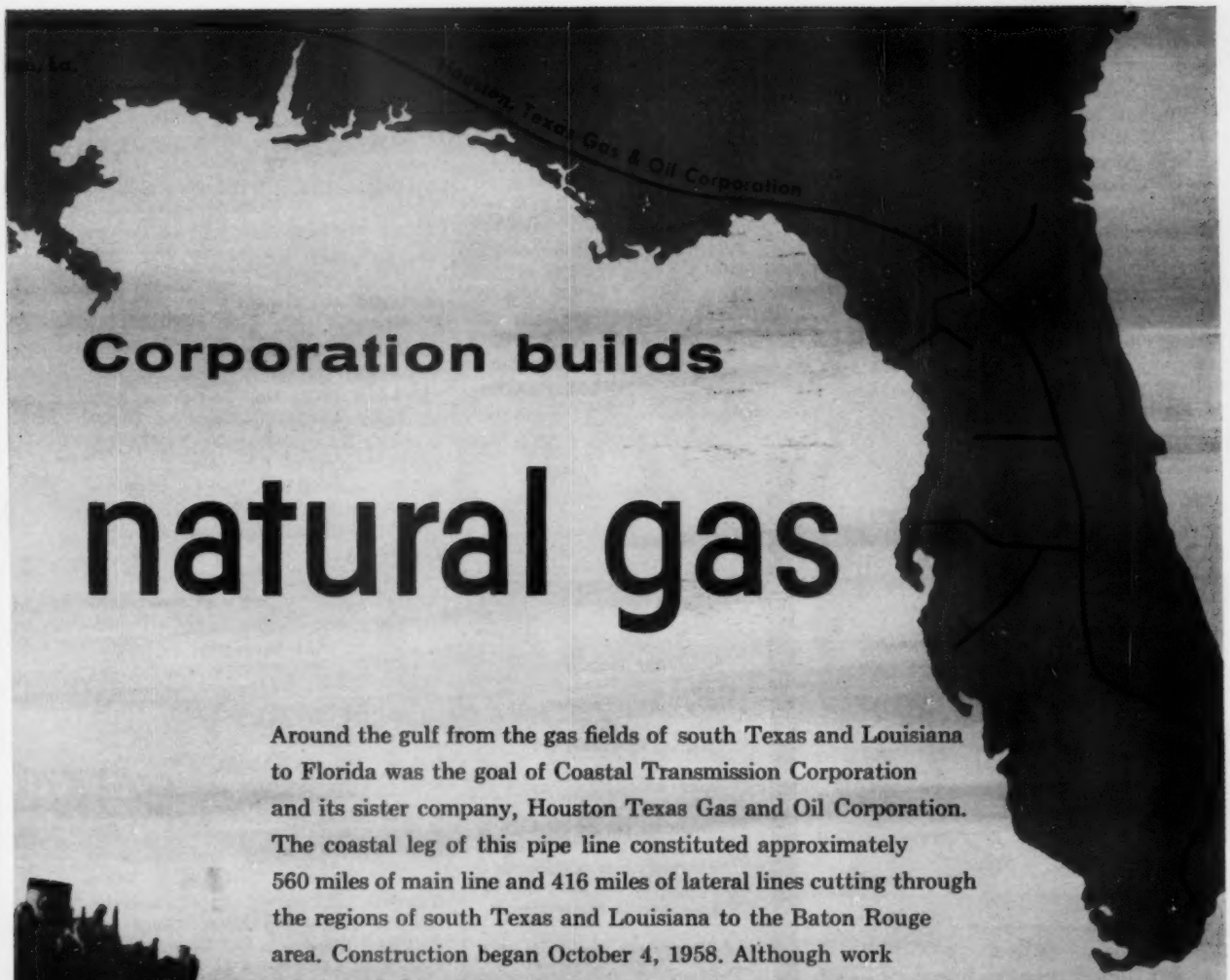
Coastal Transmission
gulf stream of



Corporation builds

natural gas

Around the gulf from the gas fields of south Texas and Louisiana to Florida was the goal of Coastal Transmission Corporation and its sister company, Houston Texas Gas and Oil Corporation. The coastal leg of this pipe line constituted approximately 560 miles of main line and 416 miles of lateral lines cutting through the regions of south Texas and Louisiana to the Baton Rouge area. Construction began October 4, 1958. Although work was impeded by extremely swampy terrain and an unseasonably wet spring, the line was completed by June of 1959.

A. O. Smith furnished 167.5 miles of 24-inch pipe and 91 miles of 20-inch main line pipe that spans this coastal region.

For almost 30 years . . . A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is found in every important pipe line project.

CROSSING THE BAY — Approximately 11 miles of 24-inch pipe was laid across Galveston Bay. Special techniques had to be employed in crossing the busy Houston Ship Channel. All of Coastal's river crossings were submerged.

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State should decide on use of fuel

California authorities should decide how additional gas can best be used in the Los Angeles area to help relieve the smog problem, the FPC has ruled.

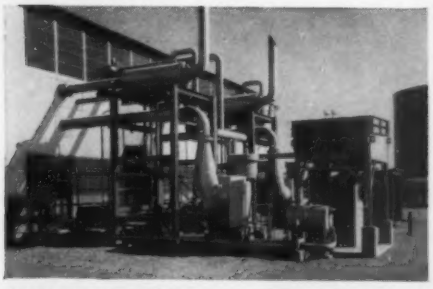
Involved is 100 MMcfd which El Paso Natural Gas Co. planned to supply to Southern California Edison Co. for use in its electric power plants. El Paso wanted to deliver the gas to Southern California and Southern Counties Gas companies, who, in turn, would deliver an equal amount of gas to Edison on an exchange basis. FPC ruled that the gas should be sold to the distributing companies rather than directly to the electric company.

The commission said it could not find any evidence "which would conclusively indicate that Edison's use of gas in place of fuel oil would be more beneficial than the conversion to gas by numerous other, less efficient users of fuel oil . . . or that the gas is not needed more vitally for household and commercial uses" (Docket G-12580, Opinion No. 333).

Authorized by the decision was construction of facilities costing about $24 million.

COMPRESSORS AND

GENERATORS ARE



MAXIM-QUIET

The new Needles, California Compressor Station operates with quiet efficiency. Maxim Silencers cut down exhaust noise and intake pulsation to the minimum. Specify the world's most widely used silencer—a Maxim. There's no quiet like *Maxim-Quiet.*

Photos courtesy of Southern California and Southern Counties Gas Companies

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Work under way on 116-mile line

Work is under way on a $17.3 million line which, when completed this summer, will swell gas supply for the southern California market by 300 MMcfd.

The 116-mile line will be owned and operated by Pacific Lighting Gas Supply Co., transmission and storage subsidiary of Pacific Lighting Corp. and affiliate of Southern California and Southern Counties Gas companies. The line stretches from the California-Arizona border seven miles north of Needles to a point near Newberry, 20 miles east of Barstow.

Contractors are Pacific Pipeline Construction Co., Montebello, Calif., and Engineers Limited Pipeline Co.

Gas Supply's line will meet the Transwestern Pipeline Co. system at Needles. Both lines are designed so that they may economically expand to carry up to 640 MMcfd.

At Newberry, the 34-in. PLGS line will connect to a proposed 36-in. line of SoCal and SoCounties, which will take the new gas supply to the Los Angeles basin.

To speed construction, PLGS has leased a pipe welding and coating yard at Minneola, near Daggett. A second yard at Henderson, Nev., has been leased by Pacific Pipelines. Engineering specs call for a twin crossing 14 ft below the bed of the Colorado river, with two 24-in. lines located 500 ft apart. The pipeline will be built by the bell-hole method.

New gas find in Canada

Pacific Petroleums Ltd. has a substantial new gas discovery in the prolific Jedney-Bubbles-Laprise area of northeastern British Columbia. Four drillstem tests resulted in gas flows totaling 4.8 MMcfd through a total interval of 198 ft.

Kansas-Nebraska can build

Kansas-Nebraska Natural Gas Co. has been authorized to construct 15.5 miles of 12-in. mainline loops, 3000 compressor hp in existing stations, and a new 1800-hp station. The Phillipsburg, Kan. company will spend $1.4 million on the facilities (Docket G-17839). Kansas-Nebraska also plans to build other field and general plant facilities to cost about $2.5 million.

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for hazardous journey, small wages, bitter cold, long months of complete darkness, constant danger, safe return doubtful. Honor and recognition in case of success.
Sir Ernest Shackleton

would you answer?

People scoffed when the explorer, Shackleton, placed this ad in a London newspaper. Who would answer? Thousands did! Risking life in the Antarctic or facing a thorny problem in industry, man always responds to challenge.

Natural gas, for example lay idle under the earth. How could it be put to work? This challenge created the long distance pipeline. Today, through our 11,000-mile system, 18 key states are supplied with the world's finest fuel. Natural gas! More than 2 billion cubic feet daily... the equivalent of over 100,000 tons of coal.

Delivered dependably and economically 'round the clock in any weather.

From natural gas and oil... heat, power, petrochemicals that mean ever wider service to man.

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HOUSTON, TEXAS

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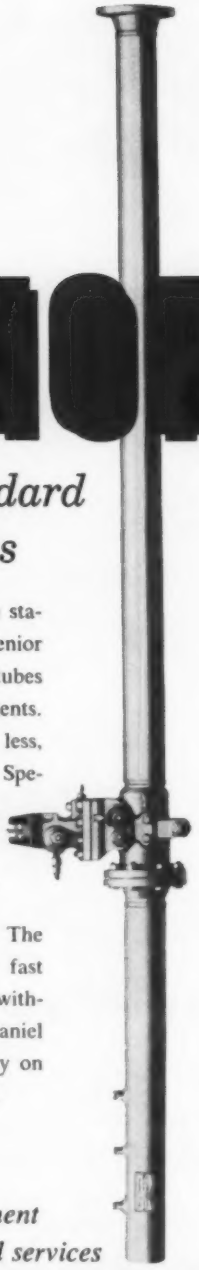
Used at sales and purchase stations everywhere, Daniel Senior "flangnek standard" meter tubes meet exacting service requirements. They are easy to order, cost less, and are available from stock. Special, factory-aligned upstream tubes combine with the Senior Orifice Fitting to provide a smooth approach to the orifice plate, free of offsets. The popular Senior fitting allows fast plate changing or inspection without line shut-down. See your Daniel representative for the full story on your best buy in meter tubes.



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Write for Daniel Catalog Section "D"

135

GAS CALENDAR

February

4-6. . AGA Home Service Workshop—Drake Hotel, Chicago
24-26. . 11th Annual Corrosion Short Course—Mayo Hotel, Tulsa.
29-Mar. 2. . AGA General Management Section Conference—Pittsburgh-Hilton Hotel, Pittsburgh.

March

3-4. . AGA-PCGA Joint Public Relations Conference—Santa Barbara Biltmore, Santa Barbara, Calif.
3-4. . SGA Distribution Section—Jung Hotel, New Orleans.
3-4. . SGA Transmission Section—Jung Hotel, New Orleans.
14-18. . National Association of Corrosion Engineers Annual Convention—Dallas.
21-23. . Mid-West Gas Association Annual Meeting & Convention—Hotel St. Paul, St. Paul, Minn.
23-25. . PCGA Sales & Advertising Conference—Villa Hotel, San Mateo.
24-25. . NEGA Annual Meeting—Hotel Statler, Boston.
24-25. . Oklahoma Utilities Association Annual Convention—Biltmore Hotel, Oklahoma City.
31. . Pennsylvania Gas Association Distribution Meeting—George Washington Motor Lodge, King of Prussia, Pa.
30-April 1. . GAMA Annual Meeting—The Greenbrier, White Sulphur Springs, W. Va.

April

5-7. . AGA Sales Conference on Industrial & Commercial Gas—The Shamrock-Hilton, Houston.
8-9. . Florida-Georgia Gas Association Convention—Biltmore Hotel, Palm Beach, Fla.
19-21. . Southwestern Gas Measurement Short Course—University of Oklahoma, North Campus, Norman, Okla.
19-21. . AGA Research & Utilization Conference—Hotel Carter, Cleveland, Ohio.
21-22. . Indiana Gas Association—French Lick-Sheraton Hotel, French Lick, Ind.
25-27. . AGA-EEI National Conference of Electric & Utility Accountants—Roosevelt & Commodore Hotels, New York.
25-27. . Southern Gas Association Annual Convention—Galveston, Texas.

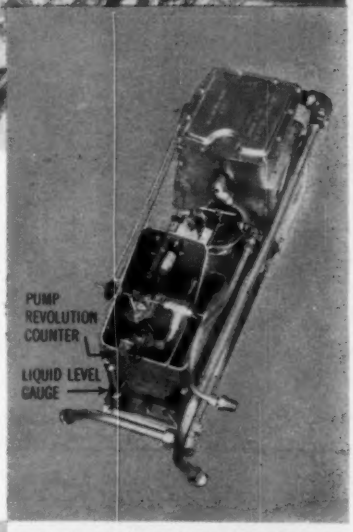
May

9-13. . AGA Commercial Gas School—Edgewater Beach Hotel, Chicago.
9-13. . AGA Operating Section, Joint Distribution & Transmission Conference—Hotels Roosevelt & Jung, New Orleans.
12-13. . AGA Eastern Gas Sales Conference—Statler Hotel, Washington, D. C.
16-18. . AGA Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.
23-25. . AGA Operation Section Production Conference—Hotel Roosevelt, New York.
24-26. . Pennsylvania Gas Association Annual Meeting—Pocono Manor, Pa.

June

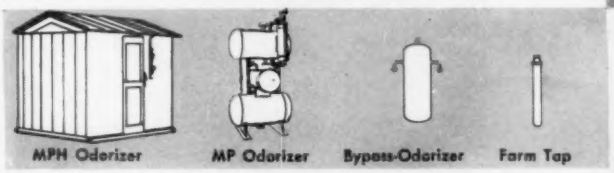
1-3. . 5th Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown.
22-25. . Canadian Gas Association Annual Meeting—Manoir Richelieu Hotel, Murray Bay, Que., Canada.
27-28. . Michigan Gas Association Annual Meeting—Grand Hotel, Mackinac Island, Mich.

Over 1200 Peerless Gas Odorizers in service...



Peerless puts the right smell in gas . . .
from the largest odorizer to bypass or farm tap.

Heart of the largest Peerless meter type MP Odorizers is the internal mechanism shown at the right . . . pump revolution counter and liquid level gauge make sure of constant odorizing rate regardless of variations in flow, temperature and pressure. The skid-mounted odorizer station type MPH, in the illustration above at right is a complete packaged unit . . . quickly installed and ideal for locations where no noxious odors are permitted. For small loads there are the Peerless units shown below . . . including bypass odorizer and farm tap. For *all your gas odorizing needs* get in touch with your nearest Peerless Representative today.



Peerless Internal Mechanism above provides accurate control of odor into the gas stream. Unit is sealed in central vessel of Peerless Odorizer between odorant storage and safety tanks. Tempered glass windows in "O" Ring closure provide visibility to counter and gauge.

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ATLANTA 5, GEORGIA

Crose, Perrault names combined in merger

Crose-Perrault Equipment Corp. will become the corporate name of the merged M. J. Crose Manufacturing Co., Inc., and Perrault Equipment Co., both of Tulsa.

". . . It is fitting that the names of both companies be included in the new organization," announced Clare G. Miller, president of Crose.

All of the key personnel of Perrault have been retained, along with Crose's men, to make up the new organization. Products will be a combination of the best features of both lines.

Favored-nation hearing gets under way

Oral argument is under way on rate increases which Pure Oil Co. claimed were "triggered" by favored-nation provisions in its contracts with El Paso Natural Gas Co.

Arguments also will cover the added issue of whether Pure's favored-nation provisions in its contracts "are void or voidable as contrary to public interest."

In November, an FPC examiner dismissed the proposed $98,877 increase. He held that the increases were not activated by El Paso's purchase of gas from another pipeline company at a higher price.

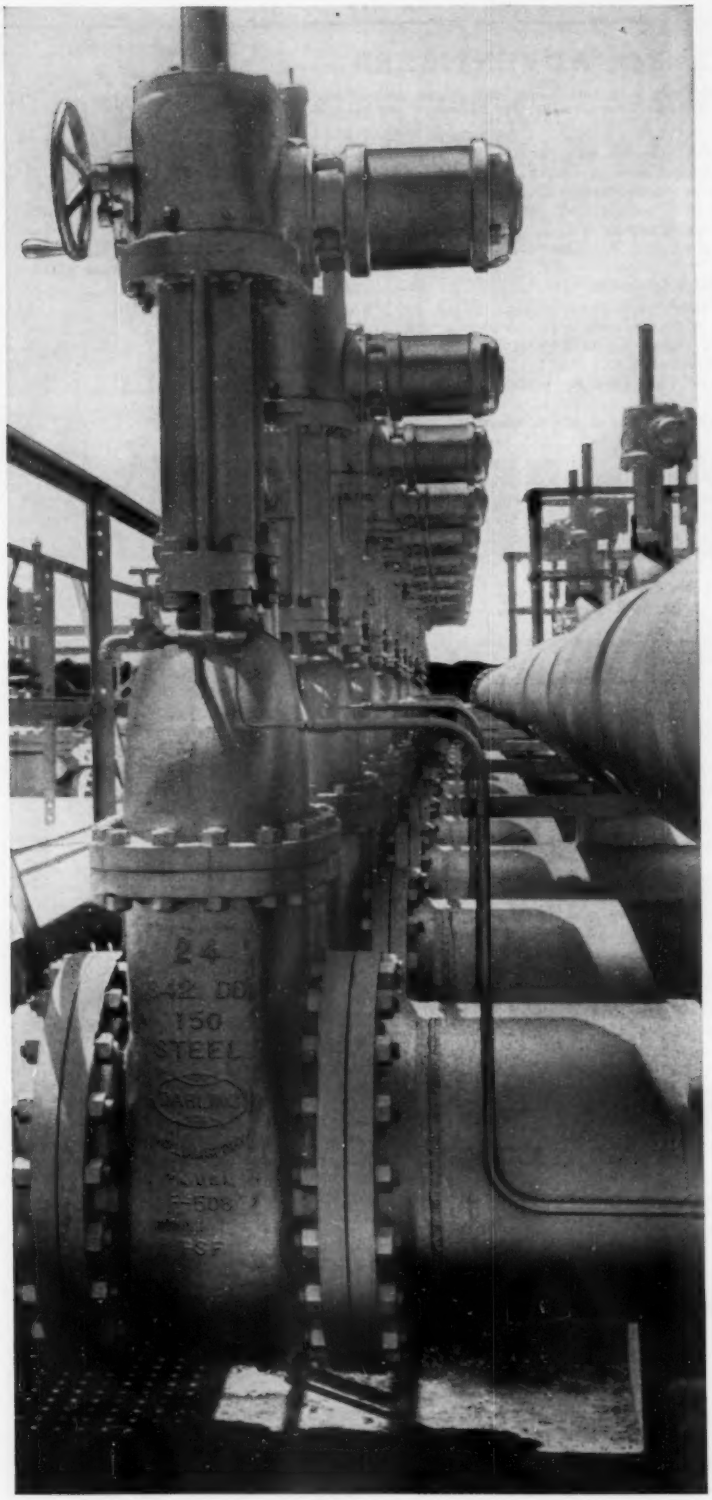
PG&E boosts deliveries

Pacific Gas & Electric Co. has installed a two-unit, 1320-hp compressor to boost gas deliveries to the North Bay area. The $600,000 job is northwest of Rio Vista where several gas lines converge from Rio Vista field and other parts of PG&E's system.

The compressor will increase gas flow through two transmission lines, one 16-in. and the other 10-in., which extend via Fairfield-Suisun, Napa and Shellville to Petaluma, Santa Rosa, San Rafael, Mill Valley and Sausalito.

Seeks more gas

Transcontinental Gas Pipe Line Corp. wants to build about 29 miles of 20-in. line and a metering station, and add 2500 hp to an existing station (Docket G-18920). The $2.4 million facilities would be used to take gas from South Texas Natural Gas Gathering Co. in LaSalle county, Texas.



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How to line up a *cost-important* principle

THESE Darling gate valves have one thing in particular no other gate valves can match—Darling's *fully revolving double disc, parallel seat principle.*

What does this mean?

Skipping to end results . . . smoother, easier valve operation . . . automatic compensation for valve body distortion to assure tight closure . . . and avoidance of wear concentration areas on both discs. In turn all this just naturally adds up to longer valve life, surer performance, less maintenance, less part replacement, less down time, and lower over-all operating cost.

These gains are a matter of record—the real reason why Darling valves today are picked for so many oil and gas line jobs. Give us an idea of your service needs and get complete, specific details on the Darling valves that can do the *best* kind of a job for you!

◀ *Line-up of Darling 24" motor-operated steel gate valves at a major crude oil pumping station. Here, as elsewhere, Darling's fully revolving double disc feature pays off.*

DARLING VALVE & MANUFACTURING CO.

Williamsport 26, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

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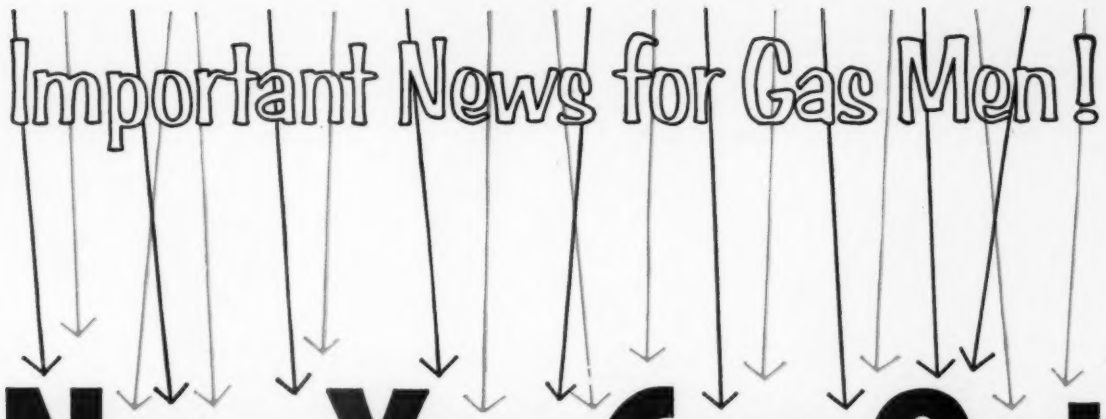

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